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It is hereby certified that a European patent has been granted in respect of the invention described in the patent specification for the Contracting States designated in the specification.

Il est certifié par la présente qu'un brevet européen a été délivré pour l'invention décrite dans le fascicule de brevet, pour les États contractants désignés dans le fascicule.

Europäisches Patent Nr.
European patent No.
Brevet européen n°

EP3777522

Tag der Bekanntmachung des Hinweises auf die Erteilung des europäischen Patents
Date of publication of the mention of the grant of the European patent
Date de la publication de la mention de la délivrance du brevet européen

03.04.2024

INSTALLATION CÔTIÈRE DE GESTION DE PHÉNOMÈNES MÉTÉOROLOGIQUES

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Präsident des Europäischen Patentamts | President of the European Patent Office | Président de l'Office européen des brevets

München, den | Munich, | Munich, le **03.04.2024**

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Date
07.03.2024

Référence	Demande n°. / Brevet N°.
PIUB001EP	20190607.0 - 1005 / 3777522
Demandeur / Titulaire	
Piufortavi	

Décision relative à la délivrance d'un brevet européen en application de l'article 97(1) CBE

La demande de brevet européen No. 20190607.0 ayant été dûment examinée, il est procédé, pour l'ensemble des Etats contractants désignés, à la délivrance d'un brevet européen ayant pour titre celui qui figure dans la notification émise en application de la règle 71(3) CBE (OEB Form 2004C) ou dans les informations (OEB Form 2004W, cf. Communiqué de l'OEB en date du 8 Juin 2015, JO OEB 2015, A52) en date du 15.11.23 et dans la version conforme aux documents indiqués dans cette notification/information.

No de brevet	:	3777522
Date de dépôt	:	12.08.20
Priorité revendiquée	:	12.08.19/FRA 1909171
Les Etats contractants et le(s) Titulaire(s) du brevet	:	AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC MK MT NL NO PL PT RO RS SE SI SK SM TR Piufortavi 17 rue Albany Juan les Pins 06160 Antibes/FR

La décision prend effet au jour de la publication au Bulletin européen des brevets de la mention de la délivrance (art. 97(3) CBE).

La mention de la délivrance sera publiée au Bulletin européen des Brevets No 24/14 du 03.04.24.

Division d'examen

Crespo Vallejo, Daci Garmendia Irizar, Ai Urbahn, Stephanie

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Lettre recommandée
OEB Form 2006A 05.23 (29/02/24)

au courrier interne: 01.03.24

Remarque relative à la décision de délivrance d'un brevet européen (formulaire OEB 2006)

Depuis le 1er juin 2023, date d'application des règlements (UE) n° 1257/2012 et n° 1260/2012, plusieurs options s'offrent aux titulaires de brevets européens pour la validation d'un brevet européen.

1. Validations nationales "classiques" dans les États parties à la CBE

Les procédures exactes et les exigences en matière de traduction pour la validation diffèrent en fonction des États parties à la CBE. La brochure d'information intitulée **"Droit national relatif à la CBE"** fournit des renseignements utiles sur les conditions de forme à remplir et sur les actes à accomplir auprès des offices de brevets de ces États aux fins d'obtenir des droits dans ces derniers.

Certains États parties à la CBE exigent une **traduction du fascicule du brevet européen**. Selon que l'État visé est ou non partie à l'accord de Londres, la traduction à fournir doit porter soit uniquement sur les revendications, soit sur la totalité du brevet. Si la ou les traductions ne sont pas produites, le brevet européen peut être dès l'origine réputé sans effet dans les États concernés.

Des **taxes annuelles "nationales"** peuvent être perçues pour les années suivant celle au cours de laquelle la mention de la délivrance a été publiée au Bulletin européen des brevets. Pour plus de détails, il convient de consulter la brochure susmentionnée.

2. Brevet unitaire : validation "unitaire" centralisée auprès de l'OEB pour les États membres de l'Union européenne participant au brevet unitaire

Le brevet européen à effet unitaire (ou brevet unitaire) est un brevet européen délivré par l'OEB, auquel l'OEB, sur demande du titulaire du brevet européen, a attribué un effet unitaire. Son champ d'application territorial couvre les territoires des États membres participants dans lesquels l'AJUB produit ses effets à la date d'inscription de l'effet unitaire par l'OEB. De plus amples informations sont fournies dans la brochure **"Le guide du brevet unitaire"**, disponible sur le site Internet de l'OEB.

Afin d'obtenir un brevet unitaire, il est nécessaire de présenter **une demande d'effet unitaire auprès de l'OEB** dans la langue de la procédure, au plus tard **un mois** après la date à laquelle la mention de la délivrance a été publiée au Bulletin européen des brevets. Cette demande doit être accompagnée d'**une traduction de l'intégralité du fascicule** soit en anglais, si la langue de la procédure est le français ou l'allemand, soit dans une autre langue officielle de l'Union européenne, si la langue de la procédure est l'anglais. Pour présenter votre demande, il vous est fortement recommandé d'utiliser la fonctionnalité du formulaire 7000 spécialement prévue à cet effet dans le dépôt en ligne (eOLF) et le dépôt en ligne 2.0.

Dans certaines conditions, les petites et moyennes entreprises, les personnes physiques et certaines entités (organisations sans but lucratif, universités et organismes de recherche publics) qui ont déposé la demande de brevet correspondante dans une langue officielle de l'Union européenne autre que l'allemand, l'anglais ou le français, ont droit à une **compensation des coûts de traduction** sous forme de somme forfaitaire si elles ont leur domicile ou leur siège dans un État membre de l'Union européenne.

Une seule taxe annuelle doit être acquittée chaque année auprès de l'OEB aux fins du maintien en vigueur du brevet européen à effet unitaire.

3. Combinaison d'un brevet unitaire avec des validations nationales classiques

Le brevet unitaire ne s'applique qu'aux États membres de l'Union européenne qui sont liés par le règlement (UE) n° 1257/2012 et qui ont ratifié l'Accord relatif à une juridiction unifiée du brevet. Certains États parties à la CBE ne sont donc pas couverts par le brevet unitaire.

Par conséquent, si une protection pour ces derniers est souhaitée en plus de celle conférée par le brevet unitaire, il sera nécessaire de procéder également à des validations nationales (voir point 1 ci-dessus).

Étant donné que les actes indispensables aux différentes validations sont susceptibles d'être modifiés, il est conseillé de toujours consulter la version la plus récente des brochures citées ci-dessus, ainsi que le site Internet de l'OEB (epo.org).

I- DESCRIPTION

Title of the invention: Coastal weather management system

[1] The present invention relates to weather management systems. More particularly, the present invention is a coastal installation aimed at managing, or even preventing, the occurrence of certain weather phenomena.

[2] Indeed, since the 1970s and in the face of growing awareness of ongoing global warming, studies have shown that certain violent weather phenomena, such as cyclones in the Indian Ocean, hurricanes in the northern part of the Atlantic Ocean or typhoons in the Pacific Ocean, have seen their frequency and intensity increase due to the average rise in surface ocean water temperatures. In 2017, a cyclone with winds of 350 km/h was observed.

[3] More specifically, a hurricane (or typhoon or cyclone) is a meteorological phenomenon that originates at sea, the formation and intensity of which depend in particular on the surface temperatures of ocean waters.

[4] However, studies have been able to demonstrate that other conditions are also necessary for the creation of a hurricane (or a cyclone...), such as:

- A humidity level above 70%, as is the case in the intertropical convergence zone, to promote the formation of cumulonimbus cloud masses.
- An absence of wind at altitude, so as not to disperse convective clouds.
- A pressure gradient to allow the movement of humid air masses and cause a depression.
- A geographical position of the place of formation of said hurricane far from the equator by a few degrees of latitude so that the value of the pseudo-Coriolis force is not zero, thus favoring the creation of a circular movement of the air masses;
- A supply of warm, humid air from gas exchanges between the ocean and the atmosphere.

[5] Concerning the exchanges between the ocean and the atmosphere, it should be noted that these take place mainly in the upper (or superficial) layers of the ocean, that is to say above the thermocline (the waters under this surface mixing layer constitute the thermocline, the waters of the thermocline undergoing a very rapid decrease in temperatures as a function of depth. These waters have very low temperatures and do not contribute to the creation of the meteorological phenomena considered).

[6] In fact, to promote the formation of a cyclone, it is necessary for the temperature of the surface water, that is to say at the level of the layer of water between the thermocline and the surface, to be higher than 26°C and this over a thickness of at least 50 meters.

[7] Thus, certain areas are considered to be hurricane (or cyclone) "nurseries", for example, maritime areas connected to islands located far from the continental coasts. One example is the maritime area west of the Cape Verde archipelago, which is fed by very warm waters produced at the continental shelf of the islands that make up Cape Verde, the waters being brought into the hurricane formation zone by the North Equatorial Current and the trade winds. It should also be noted that studies have shown that 95% of North Atlantic cyclones, over the period from 1988 to 2017, originated around the Cape Verde archipelago.

[8] Indeed, these islands have a particular layout that blocks the ocean circulation of the Canary Current, a current carrying cold water from the natural upwelling of deep (and therefore cold) waters to the surface, as can occur off the coasts of Morocco, Mauritania and Senegal. Thus, near the Cape Verde archipelago, surface waters have temperatures above 28°C during the summer (particularly due to solar radiation), which fuels the formation of hurricanes in the North Atlantic.

[9] Of course, the Cape Verde archipelago is only given here as an example; other islands or locations, such as the Chagos Archipelago, the Comoros, the Scattered Islands in the Indian Ocean, and the Mariana

Archipelago in the North Pacific also meet these criteria and are therefore likely to be places where destructive weather phenomena occur.

[10] We therefore note the urgency of finding a solution to reduce, or even prevent, the formation of such meteorological phenomena, or at least limit their intensity, this type of phenomenon causing loss of human life and material damage sometimes amounting to several billion euros (we can notably think of Hurricane Irma in 2017 which caused 134 deaths and material damage estimated at 67.8 billion dollars).

WO2011/011370A1 and CN101403472B disclose a coastal weather management facility.

[11] The invention is a coastal installation for managing meteorological phenomena according to claim 1, said installation comprising:

- Conduits starting from the said installation and extending to a depth below the oceanic mixed layer (therefore preferably at the level of the thermocline and in an area where the waters advantageously have a temperature below 18°C);
- Pumps for pumping water, such as water below the oceanic mixing layer (including through said conduits) to said facility.
- Means for dispersing the pumped water allowing said pumped water to be mixed with surface ocean water;
- At least one well which is connected, on the one hand to the pumps by one or more pipes, and on the other hand, to the conduits, the said at least one well filling via the conduits, with water coming from below the oceanic mixing layer by a communicating vessel effect.

[12] Said installation thus makes it possible to pump water located below the mixing layer, preferably having a temperature difference of at least 10°C with the surface water, to mix this pumped water with the surface

water by means of the dispersion means . This has the effect of reducing the temperature of the surface water and thus limiting the occurrence of violent meteorological phenomena and/or reducing their intensity.

[13] Furthermore, the mixing of nutrient-rich water from the depths with surface water promotes the development of flora and fauna, thus contributing to the prosperity of fishing and aquaculture.

[14] It should also be noted that the contribution of cold water promotes the absorption of atmospheric carbon dioxide by surface ocean waters.

[15] The said installation also makes it possible to combat global warming, for example, by reducing the temperature of surface waters around tropical islands of volcanic origin with a continental shelf by 2 degrees, the production of water vapor in the atmosphere (a gas which is also a greenhouse gas) is reduced. Furthermore, the local cooling of surface waters in certain places located in the equatorial zone also leads to a reduction in the temperature of locally generated air masses. The invention therefore also has the advantage of reducing the frequency and/or intensity of heatwave events in non-equatorial zones (i.e., limiting the long periods during which temperatures are above seasonal norms).

[16] According to a possible characteristic, said installation comprises electrical supply means such as photovoltaic panels and/or wind turbines.

[17] Equipping the coastal facility with power supplies makes it energy self-sufficient. Furthermore, combining several different and complementary power supplies allows the facility to operate during the day and at least part of the night, and preferably at least 20 hours a day.

[18] According to another possible characteristic, the installation is located at the edge of the coast or at the edge of the beach, and preferably close to land areas with a continental shelf, for example by means of concrete foundations.

[19] In fact, it is less expensive to build the facility on the edge of a beach or in shallow waters (near the coast), because it is easier to build concrete foundations and thus create a more durable structure that can withstand bad weather and various natural events.

[20] Moreover, this design helps to cool the air near the beach.

[21] According to another possible feature, the electrical supply means are located at a distance from the dispersion means and are connected to the pumps (requiring an electrical supply) by buried electrical lines.

[22] Said supply means are, for example, located at a distance of at least 5 km inland from the pumps in order to limit the corrosive effects of sea water on said means. In addition, in the event of bad weather, this reduces the risk of breakdown, and the risks associated with interventions in the context of maintenance or repair. Furthermore, the arrangement of said supply means inland makes it possible to reduce visual and noise pollution on the beach, generally tourist locations.

[23] According to another possible characteristic, said pumps are submersible pumps and/or electric pumps.

[24] The pumps are preferably submersible electric pumps placed in the conduits at depths of between 1.5 and 4 m, so as not to be sensitive to tidal phenomena.

[25] According to another possible feature, said conduits are laid on the seabed.

[26] The conduits are thus protected from the weather and the air. In addition, said conduits are advantageously made of special steels resistant to sea water, and have a standard diameter of 8 inches (approximately 20.32 cm).

[27] According to another possible characteristic, one of the ends of said conduits is located at a depth greater than 70 meters.

[28] According to another possible characteristic, the means of dispersal are water cannons.

[29] Water cannons are a low-cost, low-maintenance method of dispersing pumped water over a large area, thereby promoting mixing between surface ocean water and pumped water.

[30] In addition, the use of water cannons causes the formation of cold water droplets in the atmosphere, which will limit or even prevent exchanges between the atmosphere and the surface layer of ocean water, thus limiting the evaporation of warm surface waters. Furthermore, these suspended droplets also limit the warming of surface waters by the sun's rays.

[31] According to another possible characteristic, said means composing said installation are arranged regularly around an island.

[32] In order to optimize the cooling of surface water, it is advantageous to have pumps and means of dispersion at regular intervals around the perimeter of an island (or along a coast).

[33] According to another possible characteristic, the said installation has concrete foundations, on which the means of dispersing the pumped water are arranged.

[34] According to another possible characteristic, each of the conduits and/or dispersion means is supplied by at least one pump.

[35] According to another possible characteristic, said installation comprises a seawater desalination module, at least one of said conduits comprises, for example, a bypass supplying said desalination module.

[36] Indeed, it is advantageous to be able to supply drinking water to the populations living around the said installation, and in particular on islands.

[37] The invention will be better understood and other objects, details, characteristics and advantages thereof will appear more clearly during the following description of particular embodiments of the invention, given solely for illustrative and non-limiting purposes, with reference to the appended drawings, in which:

- Figure 1 is a schematic representation in perspective from above of an installation not according to the invention.
- Figure 2 is a very schematic, sectional view of the installation of Figure 1.
- Figure 3 is an enlarged view of part of the installation of Figure 1.
- Figure 4 is a very schematic and sectional view of an installation according to the invention.

The embodiments shown in Figures 1 - 3 are not part of the invention, but represent elements of the state of the art which are useful for understanding the invention.

[38] Thus, Figure 1 is a schematic representation in perspective from above of a coastal installation 1 for managing meteorological phenomena.

[39] More specifically, coastal installation 1 is located on the edge of beach P.

[40] As more particularly illustrated in Figure 2, installation 1 comprises:

- Conduits 5 arranged on the seabed F (i.e. on the ground), starting from said installation 1 and extending towards the ocean S.
- Pumps 7 for pumping water through said conduits 5 to said installation 1.
- Means 9 for dispersing the pumped water making it possible to mix said pumped water with surface water.
- Electrical power supply means 11 intended to supply said pumps 7 with energy.

[41] 5-inch conduits, for example, are corrosion-resistant steel conduits with a standardized diameter of 8 inches, identical to the conduits used in the petroleum industry.

[42] More particularly, the conduits 5 extend to a depth below the mixed layer or at the thermocline, that is to say in an area where the ocean waters have temperatures equal to or lower than 18°C.

[43] The pumps 7, for their part, are preferably submersible and electric pumps arranged inside said conduits 5 (at least one pump per conduit). In addition, said pumps 7 are located at depths of between 1.5 and 4 meters,

on the one hand to avoid the pumps losing their prime during tidal range, and on the other hand, to limit the cost of installing said pumps (indeed, when the depths are too great, the installation of the pumps requires expensive specific equipment).

[44] In an alternative embodiment not shown, the pumps 7 are so-called surface pumps (therefore not submerged) arranged in a room fitted out at least 3 meters below sea level. This has the advantage of reducing the cost of the pumps and their maintenance, in return for a greater investment linked to the construction of dedicated underwater premises to accommodate said pumps.

[45] The dispersion means 9, in the present example, are water cannons which make it possible to disperse in an aerial manner the cold waters pumped from the depths of the ocean. It will be noted that the water cannons 9 are for example, connected to the head of the pump 7 by means of a flexible tube (such as a flexible tube of 6 inches in diameter, or approximately 15.24 cm), this type of connection facilitating the maintenance, installation and disassembly for revision or replacement of the pumps.

[46] However, the dispersion means 9 may be any means for mixing the pumped water with the surface water, such as conduits opening into the water near the installation 1.

[47] The electrical supply means 11, for their part, are advantageously photovoltaic panels 11a or wind turbines 11b, said supply means 11 being connected to the pumps 7 to supply them with electricity. Nevertheless, said means 11 can also supply electricity to any useful element of the installation 1.

[48] It should be noted that the installation is located at the edge of the coast or at the edge of the beach, and preferably near (or at the edge of) land with a continental shelf. Indeed, given the function of the installation and the geographical areas in which it is to be built, it is preferable for the foundations to be made of concrete, but other means of construction are possible if they have the required solidity.

[49] Furthermore, the free end of the conduits 5 is preferably located at a depth of at least 70 m, a depth where the water has a temperature equal to or lower than 18°C.

[50] Installation 1 is advantageously located on an island, for example on the island of Boa Vista in the Cape Verde archipelago.

[51] As more particularly illustrated in Figure 3, the conduits 5, the pumps 7 and the dispersion means 9 are arranged at regular intervals all around the island of Boa Vista, along the beach, by means of concrete foundations.

[52] Said electrical power supply means 11 then make it possible to power the pumps 7 for around twenty hours per day and therefore to pump and mix water having a temperature less than or equal to 18°C with surface water whose average temperature is around 28°C in summer. Calculations have been able to demonstrate that adequate sizing of the various means of the installation makes it possible to obtain a reduction in the temperature of the surface water of more than 2°C, and therefore to keep a temperature of the surface water below the critical threshold of 26°C which favors the occurrence of hurricanes.

[53] It will be noted that in another variant embodiment not shown, said installation comprises a seawater desalination module. Said module is located close to the conduits 5 which supply it with seawater to be desalinated and is connected to the supply means 11 by said buried electrical lines.

[54] Figure 4, for its part, is a very schematic and cross-sectional representation of a coastal installation 1' for managing meteorological phenomena according to the invention.

[55] It should be noted that for the description of figure 4 the same references will be used to designate the same elements.

[56] Thus, installation 1' includes:

- Conduits 5 starting from said installation 1 and extending towards the ocean S.

- 7 pumps for pumping water.
- Means 9 for dispersing the pumped water making it possible to mix said pumped water with surface water.
- Electrical power supply means (not shown) intended to supply said pumps 7 with energy.

[57] However, unlike the installation described in figures 1 to 3, the installation 1' comprises at least one well 8 which is connected, on the one hand to the pumps 7, by one or more pipes 7a and, on the other hand, to the conduits 5.

[58] The conduits 5 which are according to the invention produced by drilling, extend obliquely through the rock of the edge of the continental shelf until they open out at a depth where the water has a temperature less than or equal to 10°C (therefore at a depth located below the oceanic mixing layer).

[59] The ocean water from the depths fills the well 8 by a communicating vessel effect and via the conduits 5. The ocean water from the depths is thus brought into the well 8 without expenditure of energy and is stored there until use.

[60] The pumps 7, as before, make it possible to pump the cold water (from the well 8) and to disperse it in the surface waters by means of the dispersion means 9, such as water cannons.

RE CLAIMS

[Claim 1] Coastal installation (1) for managing meteorological phenomena, said installation (1) comprising:

- conduits (5) starting from said installation (1) and extending to depths located below the oceanic mixing layer;
- pumps (7) for pumping water;
- means for dispersing (9) the pumped water making it possible to mix said pumped water with surface ocean water;
- at least one well (8) which is connected, on the one hand, to the pumps (7) by one or more pipes (7a), and, on the other hand, to the conduits (5);

Said at least one well (8) filling, via the conduits (5), with water coming from below the oceanic mixing layer by a communicating vessel effect, characterized in that the conduits (5) are made by drilling and extend obliquely through the rock of an edge of the continental shelf until they open out at a depth located below the oceanic mixing layer.

[Claim 2] Installation according to claim 1, characterized in that it comprises electrical power supply means (11), such as photovoltaic panels (11a) and/or wind turbines (11b).

[Claim 3] Installation according to any one of the preceding claims, characterized in that it is arranged at the edge of the coast or at the edge of the beach (P).

[Claim 4] Installation according to claim 2, characterized in that the electrical supply means (11) are located at a distance from the dispersion means (9) and are connected to the pumps (7) by buried electrical lines.

[Claim 5] Installation according to any one of the claims

Previous, characterized in that said pumps (7) are submersible and/or electric pumps, for example arranged at depths of between 1.5 and 4 meters.

Claim 6] Installation according to any one of the preceding claims, characterized in that said conduits (5) are laid on the seabed (F).

[Claim 7] Installation according to any one of the preceding claims, characterized in that one of the ends of the conduits (5) is located at a depth greater than 70 meters.

[Claim 8] Installation according to any one of the preceding claims, characterized in that the dispersion means (9) are water cannons.

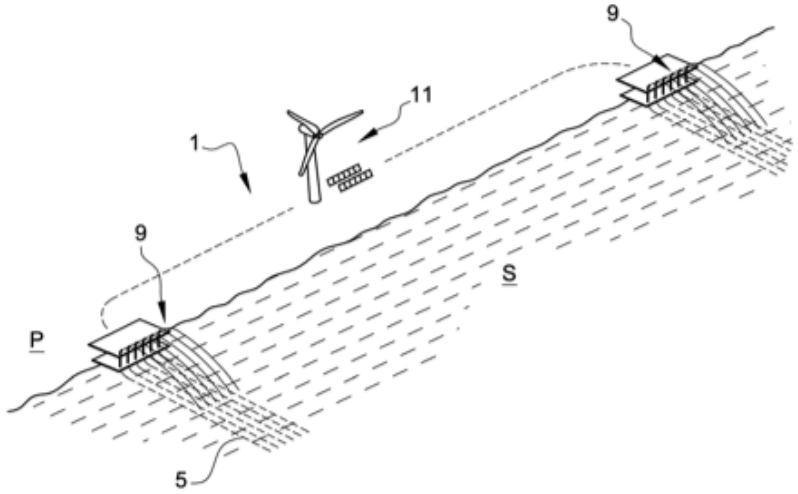
[Claim 9] Installation according to any one of the preceding claims, characterized in that it has concrete foundations on which the means (9) for dispersing the pumped water are arranged.

[Claim 10]. Installation according to any one of the preceding claims, characterized in that each of the conduits (5) and/or dispersion means (9) is supplied by at least one pump (7).

[Claim 11] Installation according to any one of the preceding claims, characterized in that it comprises a seawater desalination module.

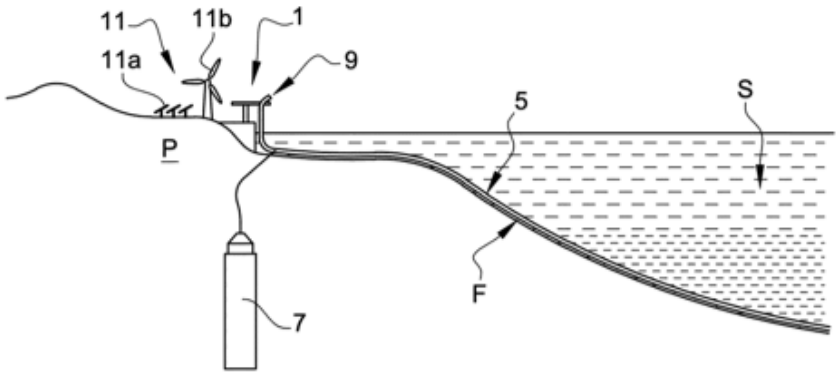
[Fig. 1]

Fig. 1



[Fig. 2]

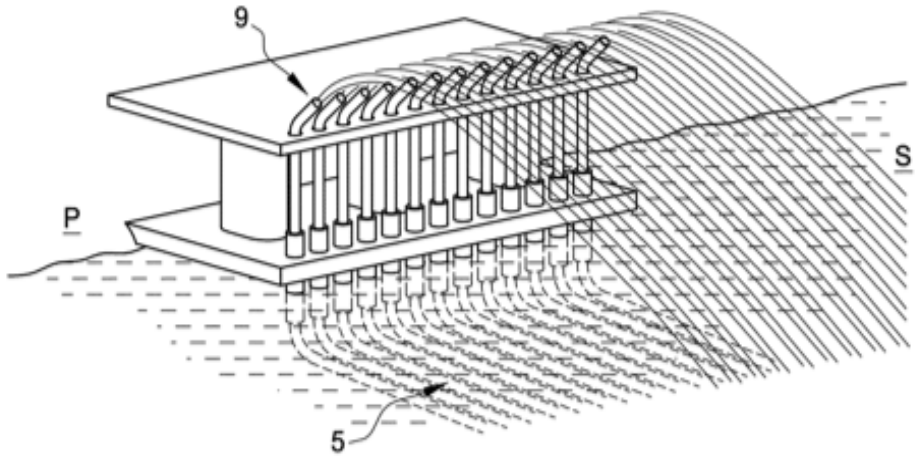
Fig. 2



[Fig. 3]

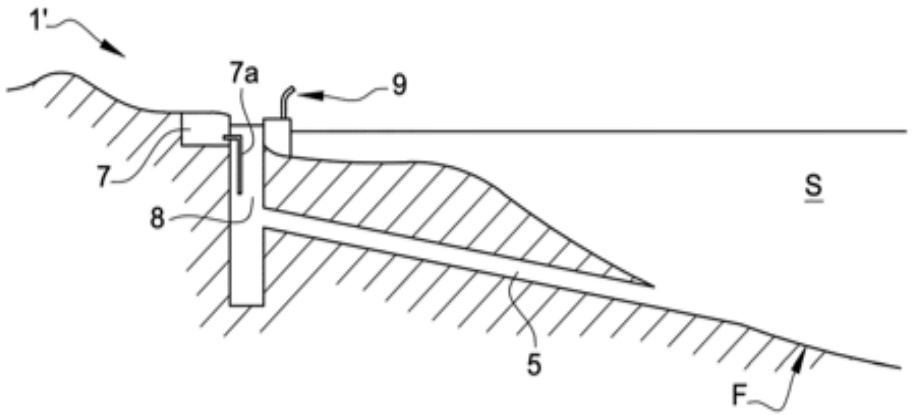
2/2

Fig. 3



[Fig. 4]

Fig. 4



II-EFFICIENCY OF THE INDUSTRIAL UPWELLING PROCESS (PIU)

1- To cool ocean surface waters

example in Cape Verde, on the island of Boavista :

Calculation of the average temperature of the mixture of water masses M and m. M, is the mass of water of the continental shelf around Boavista for example at temperature t_1 =30°C, then t_2 on day 2, then t_i after i days (i varies from 1 to 365).
m, is the mass of water brought up daily by the PIU at temperature t (at depth -300 meters, t=10°C).

$t_2 = (Mt_1 + mt)/ (M+m)$ equation which simplifies by setting x=m/M $t_2 =(t_1 + xt)/ (1+x)$; x being very small we can approach the value 1/(1+x) by its limited development (complete formula on Wikipedia): 1/(1+ x)# 1-x. From where $t_2 =(t_1 + xt) (1-x)$ the squared term is negligible and the approximate formula becomes $t_2 =t_1 -x(t_1 -t)$
By an iterative calculation we have $t_3 =t_2 -x (t_2 -t) =t_1 -2x(t_1 -t)$ neglecting the terms in square of x, we thus have $t_3 =t_1 -2x(t_1 -t)$
And so on, the term of rank i becomes

$$\mathbf{t_i = t_1 - (i-1)\, x(t_1 - t)}$$

Numerical application ; i=365, t_1 =30, t=10 t_{365} =30-7280x

The values of x=m/M retained, the average depth of the continental shelf on the island of Boavista for example is about 20 meters and its surface area of 600 km2 and the volume to be cooled is about 12 billion m^3 . With 200 PIU (15 submersible pumps with a flow rate of 100 m3 /hour) or 10 submersible pumps with a flow rate of 150 m3 /hour), solar and wind operation of 20 hours per day m= 6 million m^3 of water at 10°C raised and dispersed per day. It comes x =1/2000 and t_{365} =30-7280/2000 or t_{365} =26.36 degrees. This cooling of 3.64 degrees, applied to five Cape Verde islands with a continental shelf, is sufficient to keep the surface waters of the critical zone of the North Atlantic below the threshold of 26.5 degrees, a factor that triggers the process of hurricane formation. Ultimately, the installation of 200 PIUs on Boavista and 250 other PIUs distributed over the four other Cape Verde islands with a continental shelf seem sufficient to reduce the number and frequency of hurricanes that originate in the intertropical convergence zone 600 nautical miles west of Cape Verde;

2- To cool the surface waters of the Pacific during periods of strong EL NINO, for example on the Peruvian, Ecuadorian and Colombian coasts

The most significant temperature variations in the global climate system are caused by a natural cycle that occurs irregularly every two to seven years in the Pacific Ocean and is called ENSO (El Nino- Southern Oscillation). The first phenomenon, El Nino, the warm phase of ENSO, raises the global thermometer and is caused by a weakening and/or inversion of the Pacific trade winds. And the second

phenomenon, La Nina, the cold phase, causes cooling thanks to the Pacific winds returning to their usual direction from east to west. The warm waters on the Peruvian, Ecuadorian and Colombian coasts are driven westward and an upwelling of cold waters along these coasts occurs. In English, this phenomenon is called UPWELLING.

By copying nature, man can therefore combat global warming caused by El Niño. It is therefore necessary to pump, PUMP, **PUMP**, **phenomenal quantities of cold water between 10° and 15°C to a depth of 300 meters along these coasts to limit the warming of surface waters.** It is therefore necessary to dig every 400 meters over 2,000 km of coastline, and install 5,000 wells **(5,000 PIU stations according to the invention)** with high-flow submersible pumps of 150 M3 per hour.

3- To cool surface waters in the Mediterranean

Example on the coastline of the French Riviera from Cannes to Menton

- Storm Alex from September 30 to October 3, 2020 caused torrential rains with devastating and deadly floods in the three valleys of the Vésubie, Roya , and Tinée. The 970-millibar depression, the remnant of an Atlantic tropical storm that crossed France from west to east, became stuck inland near Nice. By remaining in place and spinning counterclockwise, it gorged itself on water vapor from the overly warm waters of the Mediterranean. We have seen on NASA maps that global warming in the Mediterranean is 3°C above its historical average. If we want to reduce the probability of these autumn storms returning, we need to cool the surface waters of this coastal area by 3°C because in

August the sea is over 27°C off the Cap d'Antibes and sometimes reaches 30°C on certain beaches from Cannes to Menton.

- We therefore retain for the numerical application ; i=365, t_1 =27, t=10 t_{365} =27-6552x
- The values of x=m/M retained on the stretch of coastline from Cannes to Antibes, M the volume of water to be cooled by 3°C is approximately 600 million m3. A PIU station includes 15 pumps with a flow rate of 100 m3 or 10 pumps with a flow rate of 150 m3 per hour which operate for 20 hours, it raises 30,000 m3 per day. To cool by 3°C, 9 PIUs are therefore required to raise m= 270,000 m3 of cold water to 10°C.
- We check t_{365} =27-6552x= 27-6552*0.27/600= 2.95 °C.
- Extrapolating this result from St Laurent du Var to Menton, 21 additional carbon sinks must be installed.
- Thus, with 30 PIU stations, an investment of around 30 million euros, surface waters are cooled by 3°C, this emblematic coastal area of the Côte d'Azur is air-conditioned and 750,000 tonnes of CO2 are absorbed.

4-Effectiveness of the Industrial Upwelling Process (IUP) for cooling the Persian Gulf

The Persian Gulf is a nearly enclosed sea with an area of 251,000 km2 and a shallow depth of about 50 meters on average. It receives less water from the region's rivers than it loses through very high evaporation. Its salinity reaches 100 g of salt per liter and the surface water temperature reaches and even exceeds 32°C from May to October with scorching air temperatures exceeding 50°C. **And according to NASA, which issued a worrying warning, several countries in the Persian Gulf would become uninhabitable in fifty years because their wet bulb index would exceed 35°C, which represents a deadly risk to human health.**

But it is possible to reduce the average temperature in this area by more than 2°C and to stabilize the temperature of the waters of the Gulf, in summer, at less than 30°C in a few years of operation of our Industrial Upwelling Process and thus reduce the evaporation and salinity of this sea.

. For this, we can consider the creation of an artificial canal 10 meters wide and 10 meters deep by 4.5 km long which crosses on an east-west line the Musandam peninsula just opposite the island of Umm al Ghanam . By taking advantage of the cold waters around 10°C located at 226 meters deep to the east of the island of Abu Rashid in the Indian Ocean, this canal would have a flow of more than 500 m3 per second (roughly the same flow as the Seine in Paris). The use of 150 m3 per hour centrifugal pumps powered by solar panels and/or wind turbines would cause a powerful upwelling (rise of cold water) on the western shore of the Persian Gulf which would air-condition the shores of Oman, the United Arab Emirates as far as Qatar and Bahrain and beyond to Saudi Arabia and Kuwait.

This would provide a volume of cold water at 10°C of approximately 36,000,000 m3 per day, to cool the Persian Gulf and capture atmospheric CO2.

. For example, submerged pumps with a flow rate of 150 m3 per hour are used to discharge cold water at 10°C from this artificial canal into the Persian Gulf, i.e. a flow rate of 0.04167 m3 per second. To have a discharge rate of more than 500 m3/s as for the Seine River, it is therefore necessary to install 12,000 pumps and build a storage reservoir on the coast for this cold water supplied by lines of tubes 14 m long and with an external diameter of 32 inches (i.e. an internal diameter of 30 inches or 0.762 m) resting on the seabed. Each line is arranged over a distance of 8 NM. This requires 1058 tubes per line and 2500 lines. Every hour, 1,800,000 m3 at 10°C will be discharged onto the coast and/or beach to cool surface water to 32°C. We can expect 20 hours of operation per day, which will provide 36 million m3 per day.

- CO2 has a solubility of 2.318g per kg of water at 10°C, whereas at **30°C only 1.257g of atmospheric CO2 are dissolved per 1 kg of water.**

- For every kg of cold water discharged, the difference is 1.061 g of additional atmospheric CO2 absorbed. That is 38,196 tonnes of CO2 absorbed per day and 13.94 million tonnes per year.

III - ATMOSPHERIC RIVERS IN THE SKY

Narrow corridors of water vapor that carry heat from the subtropics to Europe and the American West, this extreme weather phenomenon, that of New Year's Eve 2022 with a weather alert and which brought torrential rain to Europe and the tip of Brittany in particular, is nicknamed **Rhum Express** because it comes from the Antilles and the Gulf of Mexico.

In the North Pacific, this same extreme weather phenomenon is called **the Pineapple Express**, which heavily rains down on California and originates in Hawaii.

. It should be noted that these narrow corridors of water vapor in the atmosphere follow the southwest-oriented corridors of the air routes that serve these regions, Caribbean - Europe on one side and the Hawaiian Islands - California on the other. Now we know that the combustion of kerosene in the reactors deposits at high altitude in the lower stratosphere between 11 and 13 km not only CO2 but also water vapor and unburned particles which aggregate the water vapor coming from the natural evaporation of the oceans (Hadley cell and Ferrel cell) of these subtropical zones.

. The atmospheric rivers that result from the acceleration of the water cycle thus demonstrate in another way the need to have calculated PARCEL, the Power of Acceleration of Global Warming and/or Localized Runaway of water vapor.

, there is less chance of atmospheric rivers forming and crossing the oceans.

IV- THE ENERGY TRANSITION

To fight against global warming

and reduce greenhouse gases

With the upcoming energy transition, lithium is (will be) the metal increasingly sought after and used in very large quantities and will undoubtedly be transported by plane. We should be happy, in France we have lithium in three regions, in Alsace, in the Massif Central and in the Pyrenees. Mines are beginning to extract ore for research and analysis. And even a processing plant for this metal and its compounds will be built in Beauvoir (Allier) in the coming years. *The company Imérys plans to extract 34,000 tons of lithium hydroxide per year from 2028, and this, for at least 25 years* according to a press release from the end of October 2022.

For example, **lithium chloride forms a concentrated brine that can be aggregated with hydrogel according to an MIT patent** . The main property of this combination is to strongly absorb moisture from the atmosphere over a wide temperature range. Large-scale use of this lithium chloride brine, which is capable of absorbing more than ten times its mass in moisture, according to MIT researchers, could provide water in any region of the world, even the most arid. The brine, having absorbed water vapor from the atmosphere, can then be heated, condensed, and collected as ultrapure water for human needs.

We must not forget that the main greenhouse gas in the Earth's atmosphere is water vapor (12,700 billion tons in 2022) even if its lifespan is only a few days, ahead of carbon dioxide (3,258 billion tons in 2022) with a lifespan of a century . If we look at the centennial variation between 1922 and 2022. By a simple rule of three, depending on the increase in average temperature on Earth (at +1°C corresponds to +7% additional water vapor in the atmosphere) we find that the mass of water vapor stored in the atmosphere in one century has increased by 939 billion tons (global warming of +1.14°C between 1922 and 2022. And the increase in one century of CO2 produced by human activities is only 759 billion tons.

Contributions (natural and anthropogenic)

The greenhouse effect of different gases

Natural water vapor **(water cycle)** present in large quantities in the atmosphere is responsible for **60% of the effect greenhouse gas . Water vapor (Additional flux)** produced by human activities is considered by a large majority of scientists and climatologists to be negligible compared to **the immense average stock of natural origin of 12,700 billion tons on average already present in the atmosphere in 2022.**

Clouds are not included in this average mass of water vapor. Since the lifetime of this gas in the atmosphere is too short (1 to 2 weeks), it is " *scientifically*

" stated that it is not possible to calculate its Global Warming Potential (GWP) over a period of 100 years, as is the case for other greenhouse gases. Without GWP, the water vapor produced annually by human activities, and moreover being a negligible quantity, is no longer considered to be responsible for runaway climate change.

. **Carbon dioxide CO2 (GWP = 1 by definition**) is responsible for **26% of the greenhouse effect ,** its lifespan is one century. **The current stock of CO2 is 3,258 billion tonnes** and human activities produce an annual flow of 36.4 billion tonnes in 2021 (40.9 billion tonnes in 2023) of which half is absorbed by natural carbon sinks (oceans, forests, photosynthesis, etc.). Only this carbon dioxide produced by the combustion of fossil fuels is considered anthropogenic and responsible for global warming.

Water vapor would have no role in the origin of this phenomenon **AND YET IT ACCELERATES IT** from a certain threshold of increase in atmospheric temperature which can be dated precisely to around 1988.

Ozone O3 is responsible for **8% of the greenhouse effect (GWP = 310).**

Finally, methane CH4 (GWP = 23) and **nitrous oxide N2 O (GWP = 296**) are responsible for the **remaining 6%.**

V- THE PARCEL

Method for calculating the Accelerating Power of Global Warming and/or Localized Runaway of Water Vapor

The University of Bern, and it is the only university in the world, which has published in its journal HORIZONS a major research result on the measurement of the quantity **of water vapor locally above Bern, the other gas of the atmosphere whose contribution to the greenhouse effect is greater than that of CO2. Its researchers found that the evolution of the vapor content of water is different in each atmospheric region .** ***There is an increase*** ***in the troposphere and in the lower stratosphere and a decrease in the*** ***mesosphere*** **. And this result is valid for continental Europe .**

. With global warming all climatologists have noted that there is an **intensification of the water cycle, each increase in temperature average of +1°C, the atmosphere can store + 7% water vapor additional .** But a very large majority of scientists consider that water vapor is an essentially natural phenomenon, the water vapor produced by human activities is considered a negligible quantity and only the CO2 produced by the combustion of fossil fuels is responsible for global warming.

. Knowing the 2021-2022 stocks and contributions of the two main greenhouse gases: average stock of water vapor 12,700 billion tons, contribution to the

greenhouse effect 60% and stock of CO2 3,258 billion tons, contribution 26%, we can deduce for water vapor the evolution of **PARCEL** (**Power of Acceleration of Global Warming and or Runaway Localized)** , an indicator that takes into account the increase in temperature over 100 years. Built on the same principles as the GWP of CO2 by calculating the changes in water vapor and CO2 stocks over 100 years, starting from 1922.

The global temperature variation of the planet from 1922 to 2022 is +1.14°C. We simulate local warmings of +1°C (IPCC objective between 1.5 and 2°C), +2°C (continents) and then local runaways +3°C (Europe), +4°C (Alaska) and +5°C (Arctic and Siberia). **The PARCEL is in the ratio of stock variations by the contributions of the two gases by assigning a PARCEL=1 to CO2, gas taken as reference for the calculation of the Carbon Equivalent of the different greenhouse gases. (Results table 27).**

. For PARCEL 2023, we must calculate the centennial variation of CO2 from 1923. We take 99% of the centennial variation of 2022 to which we add half of the emissions of 2023, i.e. 40.9:2=20.45 billion tonnes , i.e. the following operation (0.99*759+20.45), i.e. 771.86 billion tonnes of CO2 variation between 1923 and 2023.

THE PARCEL continuation and end of the calculation hypotheses

Mass of the 1922 CO2 stock equal to 2499 billion tons (3258*(417-97.16) /417) we deduce the **centennial variation of CO2 759 MdsT between 1922 and 2022.**

. Variation in water vapor stock between 1922 and 2022, **simulation** of temperature variation in one century of +1°C or 7% additional water vapor, we deduce the **mass of water vapor in 1922 equal to 11869 billion Tonnes** (12700/1.07) and a **centennial variation of water vapor of 831 billion Tonnes .**

. Variation in water vapor stock between 1922 and 2022, **REAL SITUATION** of temperature variation in a century of **+1.14°C or 7.98% of additional water vapor** , we deduce the mass of water vapor in 1922 equal to 11761 billion Tonnes (12700/1.0798) and a **centennial variation of water vapor of 939.4 billion Tons .**

. Variation in water vapor stock between 1923 and 2023, **REAL SITUATION** of temperature variation of +0.28°C compared to 2022, we deduce the **additional mass of water vapor in 2023 of 230.7 billion tonnes** (rule of three 939.4*0.28/1.14= 230.7) and the **centennial variation of water vapor is 939.4+230.7= 1170 MdsT .**

. Variation in water vapor stock between 1922 and 2022, **simulation** of temperature variation in one century of **+2°C or 14.49% additional water vapor** , we deduce the mass of water vapor in 2022 equal to 13589 billion Tonnes (11869*1.1449) and a **centennial variation of water vapor of 1720 billion Tons .**

. Variation in water vapor stock between 1922 and 2022, **simulation** of temperature variation in one century of **+3°C or 22.5% additional water vapor ,** we deduce the mass of water vapor in 2022 equal to 14540 billion Tonnes (11869*1.225) and a **centennial variation of water vapor of 2951 billion Tons .**

. Variation in water vapor stock between 1922 and 2022, **simulation** of temperature variation in one century of **+4°C or 31.08% additional water vapor ,** we deduce the mass of water vapor in 2022 equal to 15558 billion tons (11869*1.3108) and a **centennial variation of water vapor of 3689 billion tons .**

. Variation in water vapor stock between 1922 and 2022, **simulation** of temperature variation in a century of **+5°C or 40.25% additional water vapor ,** we deduce the mass of water vapor in 2022 equal to 16646 billion tons (11869*1.4025) and a **centennial variation of water vapor of 4777 MdsT .**

The PARCEL, results table

We find:

-1) for **+1°C PARCEL (H2O) = 2.53 (** 831*0.6/ (759*0.26) = 2.526

-2) for **+1.14°C Actual 2022 PARCEL (H2O) =2.85(939*0.6/ (759*0.26) = 2.8549**

-3) for **+1.42°C Real 2023 PARCEL (H2O) =3.5(1170*0.6/771.86*0.26) = 3.4980**

-4) for **+2°C PARCEL (H2O) = 5.23 (** 1720*0.6/759*0.26 = 5.2295

-5) for **+3°C PARCEL (H2O) = 8.97** (2951*0.6/759*0.26) = 8.9723

-6) for **+4°C PARCEL (H2O) = 11.21 (** 3688°0.6/ (759*0.26) = 11.2131

-7) For **+5°C PARCEL (H2O) = 14.52** (4777°0.6/ (759*0.26) = 14.5241

Let us consider a PARCEL varying parabolically from 2.53 to 14.52 depending on the increase in atmospheric temperature. We will retain an average PARCEL simulation between +2°C and +5°C of 10 (average lines 4, 5, 6 and 7)

PARCEL simulation average (H2O) # 10

VI - DEHYDRATION OF THE ATMOSPHERE,

thanks to global air transport

Current trajectory of the energy transition in air transport focuses solely on decarbonization by eliminating the use of fossil kerosene as much as possible. On February 21, 2024, Airbus and TotalEnergies signed a strategic partnership to develop green aviation fuels (SAF and e-kerosene). But the combustion of 1 kg of kerosene in a jet engine produces 3.84 kg of carbon dioxide (CO2) as well as 1.25 kg of water vapor. Using green fuel reduces the carbon footprint, but the combustion of 1 kg of e-kerosene will still produce 1.25 kg of water vapor. And aircraft condensation trails will still be present in the atmosphere. If we can reverse priorities through innovation and also reduce the mass of water vapor in the atmosphere, it will be easier to control and contain global warming.

MIT research is very promising with the association of hydrogel with lithium chloride . Airbus engineers could patent a system for quickly attaching small aerodynamic containers of low thickness between 15 and 20 cm equally distributed above the fuselage and containing this mixture in contact with the atmospheric air. For example, on a Paris-Nice flight, if the consumption is around 3200 kg of

kerosene, 4000 kg of water vapor are also injected into the lower stratosphere. It would be enough to embark in Paris 400 kg of magic potion, hydrogel plus lithium chloride, to MOP UP 4000 kg of atmospheric water vapor that one disembarks in Nice, i.e. a neutral balance of the flight for this greenhouse gas. It should be noted paradoxically that the mass of the plane at landing is 400 kg greater than that of takeoff. On a long-haul flight that often takes off at the maximum authorized weight to carry the maximum payload, it will be necessary to make a compromise and limit the magic potion carrying from 1000 to 2000 kg for example by reducing the payload accordingly. On arrival there will be an additional mass of 10,000 to 20,000 kg of water and it will be necessary to check that the kerosene consumption will be sufficient to respect the maximum landing weight.

VII-SUMMARY: THE CLIMATE EMERGENCY GOES THROUGH THE INVERSION OF PRIORITIES

A famous Polytechnician on every television set is calling for a halt to all air travel to save the planet, with only four flights per lifetime. But AIRLINE PILOTS have the opportunity to put an end to the unbearable Climate Change that our planet is experiencing year after year without stopping air travel.

MIT, the Massachusetts Institute of Technology, a research university in Cambridge, located near Boston, defined a schedule in 2023 to **achieve the objectives of sustainable aviation by 2030.** There are five years left to draw up a new future for aviation. (You can see the study carried out on

https://report.aiazero.org/). Indeed, they identified that the impact on the global climate of stratospheric contrails from aviation is **an accelerator of global warming** . And there is an urgent need to address this acceleration as a priority. of Global warming without decarbonization by SAF fuels. There is a reversal of priorities first we deals with water vapor and, secondarily, carbon dioxide.

In France and Europe, climate change is on a trend of +3 to +4°C by 2030. And the government has published the PNACC-3 to adapt to a warming of +4°C by 2100.

As early as 2019, I also identified that global air transport is the cause of the climate change we are currently experiencing. In August 2019, I filed a patent with the INPI to combat global warming and excess water vapor. **The title of my invention is, Coastal installation for managing weather phenomena.** On April 21, 2023, the INPI recognized the accuracy of my work and granted me the national patent. On April 3, 2024, it was the turn of the European Patent Office in Munich to recognize my work and I obtained a Single European Patent.

A direct reading of NASA temperature readings by hemisphere shows linear variations at the beginning of global warming and then since 1992 differential variations in temperatures in the Northern Hemisphere compared to the Southern Hemisphere. In mathematics, a linear variation amounts to solving an equation with one unknown and for a differential variation, we must solve a differential equation with two unknowns. Thus we see:

- on the one hand, that the greenhouse gas CO2 is the main cause of the Initial and linear Global Warming (unknown RC) of the two hemispheres. This is visible from 1967 on the NASA/GISS/GISTEMP v4 temperature curve.
- and on the other hand that the greenhouse gas solely responsible for Climate Runaway (unknown EC) is none other than water vapor. What can be seen on the same curve is that Climate Runaway begins in 1992. And this is confirmed by the MIT publication of April 2023.

I proposed a calculation of the PARCEL of water vapor (Power of Acceleration of Global Warming and/or Localized Runaway) as a function of the temperature variation:

Var T +1°C. +2°C +3°C. +4°C. +5°C

Parcel 2.53 5.23 8.97 11.21 14.52

Average simulation plot equal to 10 between 2 and 5°C.

Some figures in 2022, it was calculated that 12,700 billion tons of water vapor were suspended in the atmosphere for a positive temperature variation of 1.21°C compared to the end of the 19th beginning of the 20th century . In 2023 this temperature climbed to 1.36°C and 133.4 billion tons of additional water vapor accumulated in the atmosphere. In 2024, the hottest year of the century, there was a jump in the thermometer to 1.57°C and the atmosphere stored 195.5 billion tons of additional water vapor.

In summary, for the two main greenhouse gases, in billions of tonnes in the atmosphere, we find

Water vapor H2O / Carbon dioxide CO2

	Billion Tons	Billion Tons	Proportion
Greenhouse effect	**60%**	**26%**	**x 2.308**
2022 >	**12,700**	**3258**	**x 3,898**
2023 >	**+ 133.4**	**36.8**	**x 3.625**
2024 >	**+ 195.5**	**37.4**	**x 5.227**

The acceleration in 2024 is phenomenal and in the mass ratio, the annual additional mass of water vapor suspended in the atmosphere is more than 5 times that of CO2. Extreme weather events in the year 2024:

Dry since 1970, the re-watering of Lake Iriqui in southern Morocco by torrential rains in the Sahara. Abundant snow in the Al- Jawf desert in Saudi Arabia has raised questions among climatologists. Climate bombs devastated the northwest of the American continent in November. Closer to home, cold drops at altitude in France and especially in Spain with torrential rains and mud torrents have sowed terror among the population by destroying everything, cities, roads and bridges. We must no longer hide our faces and say that water vapor is a natural phenomenon and does not influence the climate .

Decarbonizing human activities a little is necessary but is no longer sufficient, we need to DEHYDRATE A LOT and it is much easier and above all, by far the least expensive.

In detail and according to the readings on the NASA temperature curve (see the graph below) we note: The reference period being 1951-1980, we note that over 41 years from 1880 to 1921 the Southern Hemisphere is slightly less cold than the Northern Hemisphere, the coldest year being 1916 with a temperature difference of -0.6°C.

Then over 46 years from 1920 to 1966 we see the beginning of global warming in the Northern Hemisphere with a negative difference until 1930 and then the difference becomes slightly positive on average until 1966, the year of the end of Air Transport with propeller planes and the beginning of jet planes.

From 1967 to 1990, global warming began to be visible, with a difference of between 0.2°C and 0.6°C, with the hottest year being 1990. Furthermore, we can see that the Southern Hemisphere is slightly warmer than the Northern Hemisphere. While the temperature difference in the Southern Hemisphere follows the same gentle, linear slope, with a difference going from 0°C in 1970 to 0.6°C in 2022. That is a temperature increase of 0.1154°C every 10 years. Both hemispheres have the same carbon dioxide, CO2, content. If this greenhouse gas were the only cause of global warming, both hemispheres would have, on average, roughly the same climate change as they had from 1880 to 1990 over the space of 110 years. We can

therefore deduce that global warming in the Southern Hemisphere is essentially of carbon dioxide, CO2 origin.

On the other hand, from 1992 onwards, the temperature difference in the Northern Hemisphere took off and went from 0.2°C to 1.44°C in 31 years, a crazy slope of 0.4° every 10 years . global warming in the Northern Hemisphere is currently undergoing an acceleration of 3.5 times that of the Southern Hemisphere, which will give in 2100 for a temperate country like France a gap temperature between +5.25°C and +7°C. Which is very far from the PNACC-3 (National Plan for Adaptation to Climate Change) Climate) and its 51 measures to adapt to +4°C. We must face the facts: the other greenhouse gas solely responsible for Climate Runaway is none other than water vapor injected by humans into the lower stratosphere.

It was the explosion of the HUNGA TONGA underwater volcano, which propelled 140 million tons of water vapor into the stratosphere of the southern hemisphere on January 15, 2022, that revealed this extremely violent climate event. In 2023, the southern hemisphere warmed by 0.23°C, 20 times more than its historical average.

Human activities generating CO2 through the use of fossil fuels such as coal, oil or gas are identical in both hemispheres. The only human activity that deposits water vapor is 300 million tons between 9 and 13 km. altitude in the lower stratosphere, is Air Transport and the very significant proportion is **93% of flights in the Northern Hemisphere and only 7% of flights in the Hemisphere South.**

Each year in the Northern Hemisphere the deposition of water vapor from high-altitude jet aircraft is more than twice that injected by the HUNGA TONGA explosion.

The only solution to make this water vapor climate-neutral is to absolutely limit the level of World Air Transport Cruise less than 8000 meters.

It should be noted that Regional Air Transport, which uses turboprop aircraft of the ATR 42 or 72 type, whose ceiling is precisely 7,600 metres, does not contribute to climate change and their emission of water vapour at low altitude is completely neutral, as is the case for the cooling of nuclear power plants.

Further evidence of the dramatic influence of water vapor from air transport on climate has been noted.

During the covid 19 epidemic from March 2020 to December 2021, global air transport was brought to a complete standstill and NASA temperature readings over the Arctic show an average temperature drop of more than 2 degrees. Similarly, Arctic ice extent readings on the nsidc.org website show that this ice extent melted significantly from 2016 to 2020 and that since 2021 this ice extent has been reforming as a result of global air transport not flying over the Arctic Ocean. Note that with the war in Ukraine, flying over the Arctic Ocean is prohibited.

In Antarctica in 2021, the ice extent remains within the average observed from 2011 to 2020. In 2022, following the explosion of the underwater volcano Hunga Tonga, we see an accelerated melting of the ice pack with a record minimum in

2023. In 2024, the quantity of water vapor in the upper atmosphere being lower because it is evacuated over time, the ice of the Antarctic ice pack reforms.

According to the surveys of the state of Alpine glaciers provided by the University of Zurich on the Glamos.ch website , during the Covid 19 epidemic and the shutdown of air transport, it can be seen that during 2020 the melting of Alpine glaciers was significantly reduced and, above all, that during 2021 the melting of Alpine glaciers practically stopped.

To address the ozone hole in the upper atmosphere that scientists had observed since 1970, twenty-four countries and the EEC signed the Montreal Protocol in 1987. The text banned the use of chlorofluorocarbons (CFCs), used as refrigerants, solvents, and as propellants in sprays. Forty years later, all countries around the world have ratified the agreement, and the ozone layer that protects the planet is recovering. We have a similar problem to solve.

We must realize that PNACC-3 is insufficient. From the moment the cause of runaway climate change is finally identified , it is imperative to lower the cruising altitude of aircraft below 8,000 meters to save the Alpine glaciers, the poles and the High Seas during the United Nations COP 30 (Conference of the Parties). of Belem of November 2025.

To achieve this, in the Europe and Middle East zone, to include the glaciers of the Alps and the Mediterranean Sea, which are overheating at an accelerated rate

of +3° to +4°C, the national airline AIR FRANCE and its AIRLINE PILOTS must propose and set up a laboratory from January 2026. experimental as suggested by MIT *level* limitation *of flight at less than 8000 meters* . Zero water vapor in the stratosphere is thus possible in Europe from 2027 and then in the rest of the world, to achieve the objectives of sustainable aviation in 2030 .

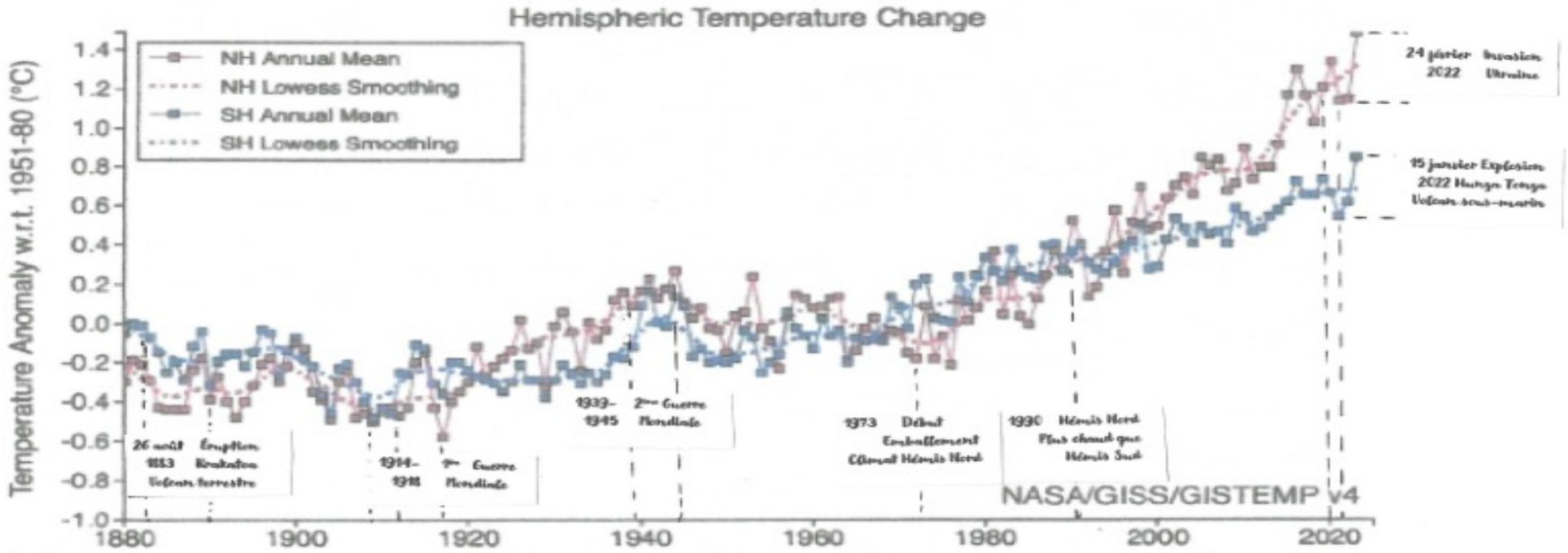
And what's more, we must keep our heads and limit future growth in air transport to between 1 and 2%, with 4.5 billion passengers in 2019 and a forecast of 9 billion in 2050 in 25 years - this is unsustainable for the planet.

And subsequently, by 2050, certain countries listed in my study will have to implement this European unitary patent to combat water vapor and residual global warming, to maintain the bearable temperature gap set in Paris by COP 21 in 2015 between 1.5° and 2°C in 2100.

Hoping to have convinced people of the importance of combating stratospheric water vapor, we can continue to fly our superb machines without shame and satisfy our passengers' desire to travel.

Gino SCATOLIN, retired CDB AF

Site https://www.piufortavi.com/ Patent



Annual and five-year lowess smooth anomalies (vs. 1951-1980) separately for the Northern and Southern Hemispheres based on land and ocean data.

Figure also available as a PNG, PDF, HTML, plain text and CSV (data columns 2, 3), or Generate PNG of the visualization's current state.

Global Monthly Mean Surface Temperature Change

Annual Mean Temperature Change in the United States

Seasonal Mean Temperature Change

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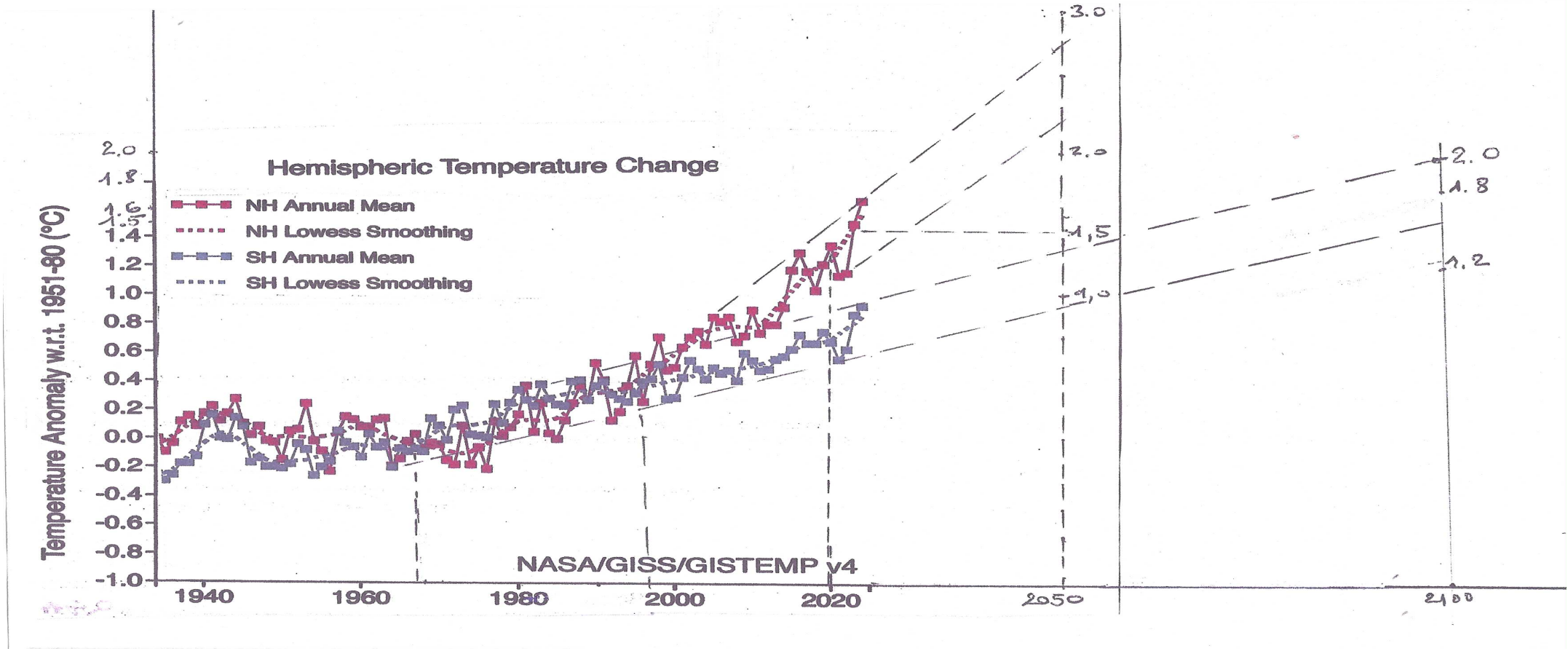
Temperatures of the Northern and Southern Hemispheres NASA archives



2050 and 2100 projections of temperatures in the two hemispheres

if we do not stop the runaway climate

Northern Hemisphere runaway from 2005 to 2025

Remarks,

Since the annual low of 10.150 million km2 in 2020, the Arctic ice pack is recovering in 2021 given the cessation of water vapor deposition produced by the non-overflight of the Arctic Ocean by World Air Transport to serve the Far East following the covid 19 pandemic. But the outbreak of war in Ukraine in February 2022 is once again increasing the melting of the ice pack.

In 2023 and 2024 its extent will return to its 2007 and 2012 value. The year 2025 does not seem likely to increase its extent but a stabilisation around 10.35 million km2 (2018 value) is very likely.

Arctic sea ice extent MKm2

	Janu	February	March	April	May	June	July	August	Sept.	October	November	Decem		Annual
2005	13,661	14,373	14,687	14.09	12,911	11,162	8,649	6,301	5,504	7,352	10.22	12,228		10,907
2006	13,466	14,325	14,421	13,906	12,517	10.92	8.46	6,496	5,862	7,541	9,659	11,955		10,773
2007	13,703	14,513	14,542	13,845	12.78	11.22	7,943	5,342	4,267	6.04	9.76	12,034		10,474
2008	13,887	14,953	15,179	14,352	12,974	11,208	8,678	5,913	4,687	7.35	10.34	12,359		10,978
2009	13,914	14,812	14,984	14,496	13,187	11.32	8,465	6,136	5,262	6.92	9,772	12.2		10,932
2010	13,739	14,581	15,137	14,659	12,866	10,585	8,075	5,875	4,865	6,984	9,614	11,831		10,711
2011	13,464	14,363	14,546	14,108	12,681	10,749	7,724	5,503	4,561	6,465	9,772	12,154		10,483
2012	13,729	14,553	15,196	14,626	13,012	10,674	7,672	4,723	3,566	5,886	9,388	12,006		10,406
2013	13,703	14,723	15,032	14,299	12,997	11.36	8,132	6,014	5,208	7,455	9,939	12,184		10,897
2014	13,648	14,418	14,758	14,088	12,701	11,033	8,108	6,078	5.22	7,232	10.12	12,353		10.79
2015	13,602	14,401	14.37	13,893	12,468	10,879	8,378	5,599	4,616	6,966	9,846	12,045		10,566
2016	13,457	14,203	14.4	13,681	11,924	10,413	7,938	5,371	4,528	6,082	8,658	11,459		10,163
2017	13.19	14.12	14.29	13,753	12,631	10,756	7,939	5,481	4,822	6,767	9,493	11,743		10,393
2018	13,077	13,967	14,298	13,696	12,232	10,778	8,268	5,615	4,785	6,134	9,823	11,862		10,355
2019	13,567	14,394	14,574	13,434	12,186	10,594	7,589	5,026	4,364	5,735	9,353	11,903		10,201
2020	13,636	14,642	14.73	13,621	12,343	10,593	7,294	5.07	4,001	5,334	8,985	11,729		10.15
2021	13,501	14.39	14,658	13,792	12,682	10,765	7,647	5,715	4,952	6,816	9.83	12,152		10,552
2022	13,872	14,612	14,586	13,986	12,879	10,875	8,287	5.95	4,897	6,657	9,725	11,892		10,661
2023	13,364	14,189	14.43	13,924	12,822	10,987	8,207	5,514	4,381	6,412	9,682	11,978		10,469
2024	13,917	14,607	14,868	14,041	12,735	10,854	7.87	5.13	4,351	5,934	9,146	11,408		10,391
2025	13.11	13,745	14,119	13,829	12,494	10,405	7.66	5,413	4,747	6,317				10,152

Antarctic sudden warming in 2022,

Remarks

Before 2021, there are fluctuations in the extent of Antarctic sea ice around 11.5 million km2. Since the explosion of the Hunga Tonga submarine volcano, there has been a sharp drop of more than 1 million km2 (-7.5% in 2022, -15% in 2023). A very marked warming of the southern hemisphere has occurred.
It is not due to the CO2 from the combustion of fossil fuels but to the 140 million tons of water vapor propelled into the stratosphere.
The sea ice is reconstituting in 2024 and 2025, it will have taken more than four years for the stratospheric water vapor to be evacuated thanks to the polar vortex.
We can deduce that the lifetime of water vapor in the stratosphere is more than 1500 DAYS and not 10 DAYS as in the lower troposphere.

Antarctic sea ice extent MKm2

	Januar	Februa	March	April	May	June	July	August	Septem	Octob	Novem	Decem		Annual
2005	4,752	2,97	4,082	7,032	10,289	13,291	16,158	17,922	18,805	18,477	16,316	9,68		11,695
2006	4,164	2,651	3,215	6,01	9,456	13,345	16,114	18,098	19,094	18,733	16,23	9,854		11,461
2007	4,673	2,905	3,835	6,418	9,648	13,287	15,956	17,682	18,861	18,508	15,892	11,981		11,687
2008	6,414	3,895	5,284	8,242	11,049	14,062	16,095	17,645	18,145	17,994	16,248	11,512		12,239
2009	5,707	2,991	4,441	7,798	10,926	13,908	16,261	18,098	18,96	18,298	15,848	10,739		12,049
2010	4,958	3,106	3,847	6,715	10,639	14,41	16,921	18,607	18,799	18,648	16,755	11,271		12,107
2011	4,512	2,519	3,368	6,097	10,093	13,333	15,752	17,805	18,739	18,218	15,757	11,199		11,501
2012	5,654	3,553	4,55	7,309	10,457	13,547	16,298	18,097	19,208	18,594	16,11	10,394		12,004
2013	5,543	3,836	5,017	7,623	10,92	14,155	16,809	18,664	19,389	19,018	16,872	11,854		12,524
2014	6,327	3,843	4,901	8,343	11,519	14,687	17,106	18,908	19,756	19,003	16,388	11,928		12,776
2015	6,852	3,799	4,964	8,373	11,716	14,475	16,775	17,749	18,444	18,409	16,175	10,655		12,414
2016	4,689	2,79	4,069	7,222	10,102	13,242	16,024	17,892	18,15	17,46	14,223	8,279		11,202
2017	3,784	2,288	2,699	5,436	9,014	12,409	15,297	17,219	17,906	17,776	15,113	9,482		10,749
2018	4,211	2,326	3,54	6,033	9,321	12,885	15,7	17,417	17,961	17,732	15,102	9,188		11
2019	3,868	2,655	3,169	5,718	8,852	12,251	15,302	17,478	18,335	17,937	14,995	9,409		10,876
2020	4,598	2,92	4,003	6,662	9,871	13,275	15,721	17,758	18,838	18,493	16,231	10,575		11,602
2021	4,777	2,892	4,484	7,132	10,401	13,542	16,452	18,194	18,509	17,689	15,042	9,245		11,579
2022	3,935	2,213	2,859	5,948	9,418	12,218	14,986	17,05	18,062	17,474	15,159	8,839		10,726
2023	3,296	1,978	2,838	5,538	8,447	11,115	13,566	15,575	16,891	16,278	14,378	8,765		9,931
2024	4,047	2,187	3,221	6,253	9,363	11,848	14,201	16,414	17,154	16,65	14,312	9,593		10,461
2025	4,693	2,218	3,002	6,173	9,273	12,114	14,665	16,502	17,636	16,965				8,650