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Isle of Man, Galapagos and sunspot data show net cooling hid double exponential ocean warming danger: +3°C in 2014, +4°C likely by 2016.

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ABSTRACT

Anthropogenic global warming (AGW) heat is trapped by the greenhouse gas (GHG) blanket, and the ocean surface layer. It is 93% in the ocean and drives atmospheric warming. The 111-year mean daily surface temperatures are 10.5±0.5°C at Port Erin (PE) Isle of Man compared with 9.6±4.8°C in Central England (CET) air. The Port Erin 5½-year max-min heat cycle synchronizes to the 11-year solar heat pump sunspot cycle. Tropical heat arrives 2 years after a solar maximum on wind-driven currents in the stratified sea surface. Runoff from bottom-up melted Arctic icesheets arrives 3½ year later at solar minimum. These warm and cold waters are the biodiversity source. PE is unique with seasonal meltwaters of Pacific and Atlantic origin. The North Pacific warms twice as fast as other oceans. All ocean near-surface gyre currents harmonize with sunspot cycles. Net cooling by polar icemelt masks catastrophic exponential ocean warming and icemelt. Eleven counter-rotating surface gyres carry heat and nutrients globally in verified ocean surface circulation system.

Exponential growth is unsustainable in a finite system. It trends to infinity. Double-exponential gets there twice as quickly. The *GHG blanket*, grown double-exponentially for 250 years, is *now in control*. Ocean heat absorption takes 150-250 years. Arctic icemelt increases double-exponentially. The Arctic long-term annual freeze-melt volume cycle is 16.8±1.3 thousand cubic km per year. Polar land icemelt adds ~500 km^3 per year. Freeze-brine of salinity >40‰ and temperature –1°C, sinks to the bottom. Equatorial evaporative-brine of salinity >36.4‰ and >28°C floats subsurface under fresh warm layers thickening westwards in tropical meridional cells to ~75m depth. This is consistent with observed extreme weather.

Heat imbalance forced Pacific Ocean temperatures above proposed limits of +2°C in 1993, to +3°C in 2014, and is on track for +4°C for 2016. Century-long daily records confirm processes ongoing for 300 years. Coast locations are where impacts are felt and real-time data collected. Corporate governance degraded physics teaching in only 60 years. Individual discovery and data collection was lost. Big science is unnecessary. Satellites cannot do plankton tows. Computer models are governed by the rule of 'garbage-in garbage-out'. They must be verified by in situ data that cannot be collected retrospectively. Continuous timeseries surface profile data from fixed ocean station locations on a global variable-boundary network are essential. Scientists, if well-trained in ocean experimental physics, can do the hard work.

Time-poor scientists, stripped of their intellectual property rights, under rewarded, poorly educated, and ruthlessly exploited by growth-obsessed commercial interests, missed catastrophic global warming and multiple extreme consequences. Climate scientists abandoned classical physics and Newton-Hooke field verification in favor of unverified beliefs, models, and apps. Climate studies confuse heat with temperature, do not include basal icemelt, density temperature-salinity function, Clausius-Clapeyron evaporation exponential skin temperature function, asymmetric brine-heat sequestration, solar and tidal pumping, infra-red GHG heat trap, vertical tropical cells, freshwater warm pools; or wind-driven surface currents at 3 percent of windspeed. Climate model mistaken assumptions lead to the absurd conclusion that evaporation in the Labrador Sea at midnight in midwinter is greater than at the midday Equator.

The Isle of Man provides an ideal location for continued monitoring and mitigation research, teaching and public service in a dedicated non-commercial independent multidisciplinary university-type setting. Quality teaching is the major priority. Commercial monopoly rights need replacement with free, fully open discussions and publications. Quality not quantity should be paramount. Internationally competitive academics should control subservient lower paid support staff.

Every day without ocean surface data means vital scientific truth lost of interest and concern to all populations. Predictions are groundless without accurate continuous ocean surface data. Skeptics, politicians, statisticians, those with stakes in the status quo, and established research censors obstructing scientific progress squabble in ignorance while the globe burns.

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Academic Discipline And Sub-Disciplines

Geophysics; Physical Oceanography; Atmospheric Physics; Newton-Hooke experimental physics; Numerical Methods;

SUBJECT CLASSIFICATION

Geophysics.

TYPE (METHOD/APPROACH)

Scientific method of classical Newton-Hooke experimental verification of assumptions, analysis and review.

1 INTRODUCTION

Newton-Hooke hourly and daily timeseries field data showed catastrophic exponential anthropogenic global warming (AGW) is masked by net cooling [1][2][3][4][5]. Solar radiation is Earth's only heat source. The controlling heat sink is the ocean surface layer. Ninety three percent of AGW is in the oceans. Solar heat declined after the 1957 Keeling Point at the 400-year solar maximum while the greenhouse gas (GHG) heat trap, and polar ice melt increased exponentially [4]. Global warming results from the heat imbalance between the harmonic solar heat source and heat sinks - the ocean surface and greenhouse gases (GHG) [5]. Basal icemelt results in net cooling during maximum solar input or GHG heat trapping. The physical processes were well-verified by the mid-twentieth century. Oceans heated from above do not convect. Heat is transported by subsurface ocean currents to polar regions where it basal melts floating ice [6][7][8][9][10]. Principles of salt and heat conservation are used to compute ice melt and brine formation. Evaporative-brine is created in the tropics, and freeze-brine in polar seas at temperatures <4°C and salinity <24.7‰.

1.1 Objective of this research

The purpose of this paper is to review our new paradigm of catastrophic asymmetric exponential warming masked by net cooling. We investigate why climate scientists have missed the greatest historic global catastrophic warming that is increasing double-exponentially. Exponential growth trends to infinity. Double exponential growth gets there more quickly.

METHODS

We use only experimental groundtruth from high quality coastal ocean timeseries data without the imposition of statistical or model re-processing. Monthly and annual means and trends show rapid changes better than standard climate 30-year means. Anomaly data are differences from comparable 10-year means. Solar cycle peaks or troughs determine starting points for trend computations. Small data gaps are filled by linear interpolation. Data showing unusual deviations from long-term means are examined for accuracy in the collection methods and compatibility with adjacent data. For example, salinities >35‰ observed at the Isle of Man from 1992-1996 were found to be consistent with tropical waters carried by surface winds rather than changes in experimental methods [1][4][3]. This was subsequently confirmed in face-to-face conversations with the supervising scientists at the time. Isle of Man and Galapagos temperature timeseries data are compared for Arctic and Antarctic meltwater cooling. Scripps and other ocean observations, central England temperature and sunspot records from 1700 relate the ocean measurements to long-term heat pump and GHG trapping processes.

RESULTS

1.2 Anthropogenic Global Warming (AGW) Heat Trap

Anthropogenic global warming (AGW) results from the heat imbalance between fluxes 1) through top-of-the atmosphere greenhouse gases (GHG), and 2) through top-of-the-ocean surface layer (Figure 1). Carbon dioxide from 40 global sites is proxy for GHG forcing. The 400k-year stable mean from Antarctic core data is ~230 ppm varying between 180-280 ppm. We use 280 ppm as a pre-industrial baseline. The infrared heat trap limits re-radiation to space. The ocean top meter limits the subsurface absorption rate of trapped heat, and re-radiation from the surface skin. After the Keeling Point 1957 400-year solar maximum, trends in the sunspot proxy solar radiation, as percent of the maximum, steadily ***declined*** as the CO_2 heat trap proxy ***rose*** above 280ppm. Linear trends diverge sharply after the 1992 Matthews Point solar high. Other gases, HCFCs, methane, and uncontrolled frack-gases, may make even larger contributions [11][5].

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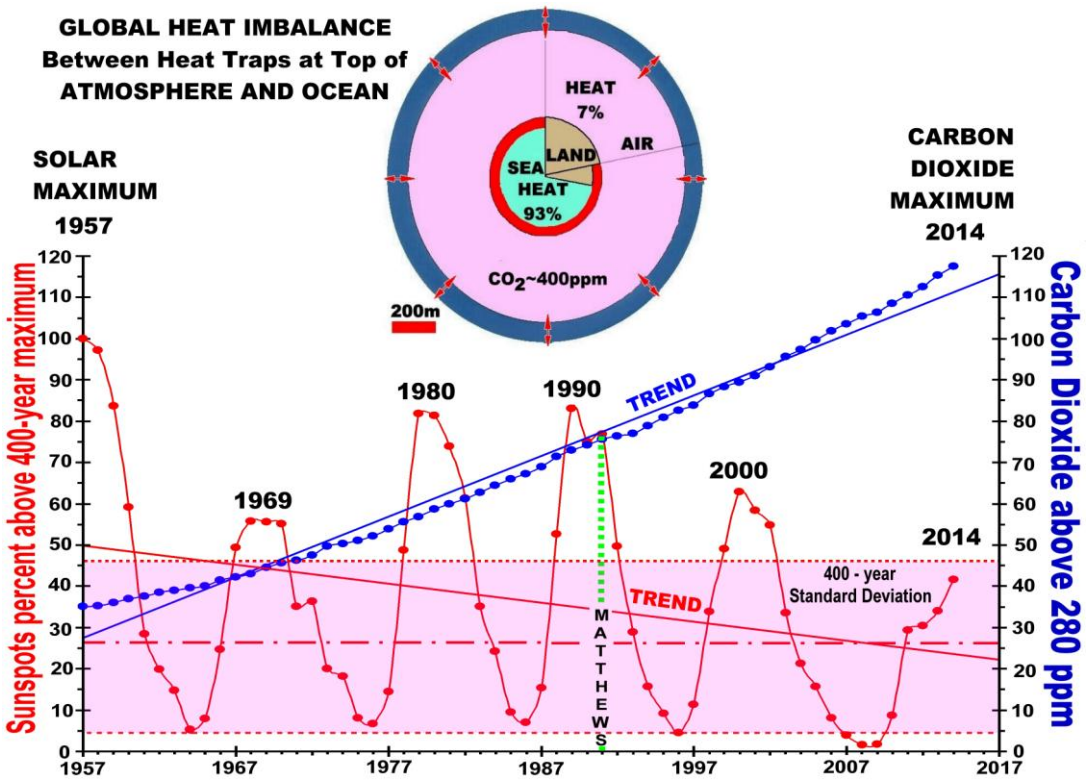

Fig 1: Earth's heat traps; top) Troposphere greenhouse gases (blue) and ocean surface (red), bottom) Anomalies 1957-2014 of sunspot total radiation proxy as percent of 400-year solar maximum, linear trend and shaded standard deviation (pink), and carbon dioxide ppm above long-term mean 280ppm (blue).

1.3 Arctic Ice double-exponential volume decay in halving time intervals

Arctic sea ice shows double-exponential decay, i.e. steady exponential decay in halving increments. The steady 5-year mean volume loss of 5 thousand cubic kilometers of ice for the September minimum, the annual, and the March maximum, (steady fractional decay of 34%, 21% and 16%) is in halving time increments (Figure 2, data sources [5]). A potential ice-free Arctic Ocean is likely for the 5-year mean centered on September 2016.

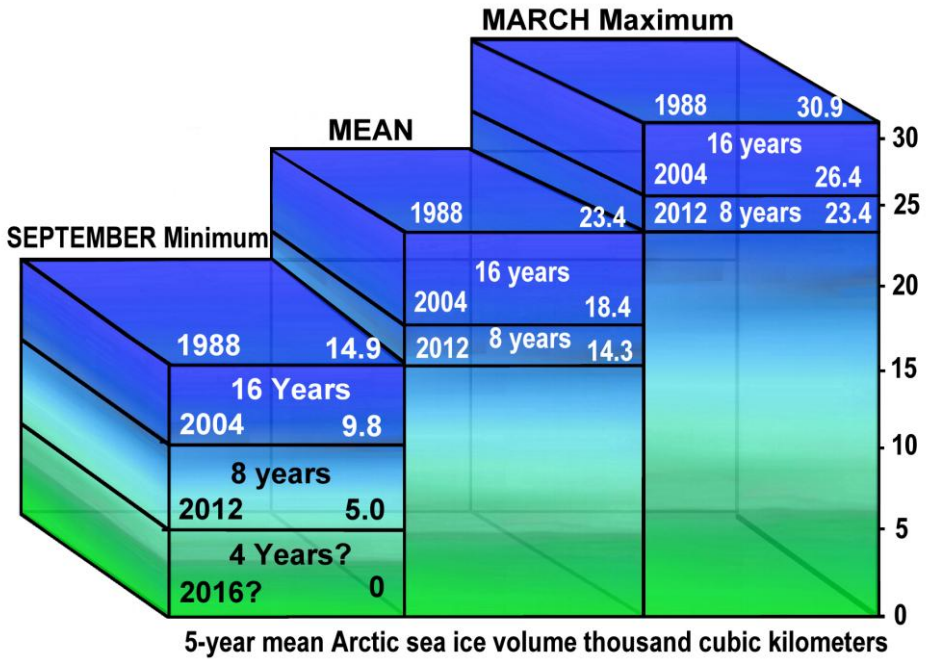

Fig 2: Arctic ice volume 1988-2014 5-year means at September Minimum, year mean, and March maximum.

The mean annual freeze-thaw cycle from 1979-2014 is 16.8±1.3x10^3 km^3 on a maximum of 33.0x10^3 km^3 dated 1 May 1979. About 50% of the total Arctic ice volume recycles each year. It is a powerful freeze-brine deep-water pump and ice

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lid against winter heat loss. Total annual meltwaters include the annual ~17x10^3 km^3, plus the exponentially increasing ~1x10^3 km^3/yr of shelf ice, 258 km^3/yr from Greenland glaciers since 2002, and Canadian Archipelago meltwater and runoff (http://earthobservatory.nasa.gov/Features/Greenland/greenland5.php). Exponential decay continues with each successive annual high or low icemelt lower than the previous year. Combined meltwaters seasonally flush Port Erin, Isle of Man carried on the Labrador/Viking gyre. Extraordinary GHG warming produces net cooling meltwaters that mask exponential warming [3][4][5]. The additional meltwaters extended the Port Erin cold spring season from February into May from the first decade of the 20th to the 21st centuries [3]. Net cooling reduced apparent global temperature rise. Floating ice melt can only raise sealevel through expansion. Net cooling reduces this effect.

1.4 Carbon dioxide GHG exponential forcing

The heat trap is often referred to as adding insulating blankets. A schematic of AGW forcing using the CO_2 proxy for greenhouse blankets Is shown in Figure 3 (for data sources see [4][5]). Carbon dioxide concentration in ppm is shown as a fixed increment of 15ppm above 280ppm from 1750-2014 (as In Figure 1).

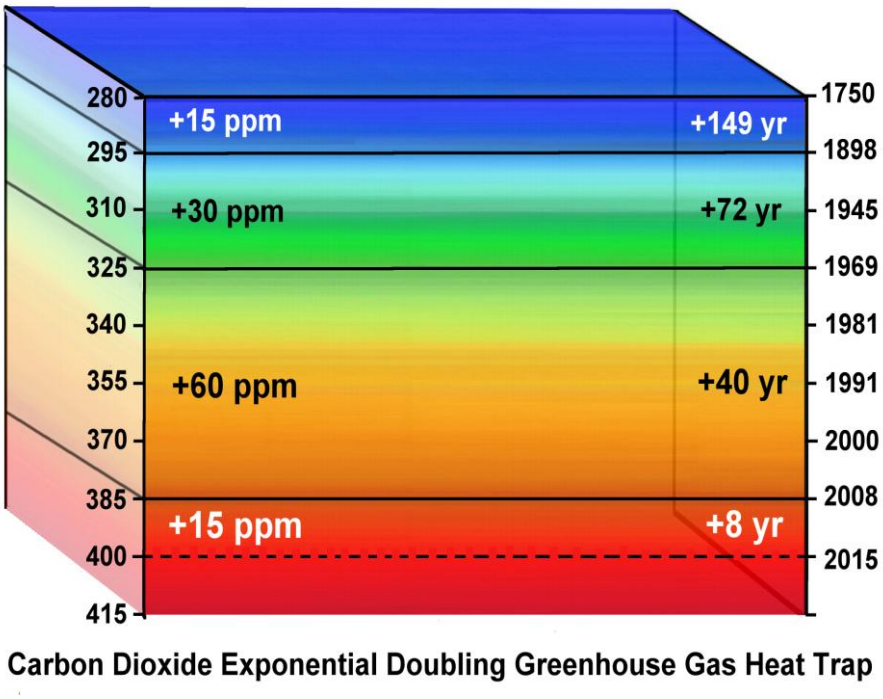

Fig 3: Atmosphere carbon dioxide ppm 1750-2015 showing the double exponential growth.

Cause and effect are clear. Double-exponential forcing is the underlying cause of rising ocean temperatures and exponential polar ice decay. Doubling increments of +15 ppm, +30 ppm, and +60 ppm were observed in successive halving increments of about +150, +70, and +40 years. The last 8-year 15 ppm increment was to a level greater than in the last 2 million-years (Pieter Tans NOAA, http://www.esrl.noaa.gov/gmd/ccgg/trends/ last access 21 May 2015). There are variations in annual increments resultant from economic recessions and wars. There were no years with net reduction in either the annual highs or lows since Keeling began accurate daily record-keeping [12]. Exponential growth shows each successive high or low higher than the previous year. April 2015 was +2 ppm higher than in April 2014.

1.5 The Dangerous Double-Exponential

Double-exponential growth is by definition catastrophic. It rapidly trends to infinity. Exponential growth is steady fractional increase of k over increment t in the exponential e^{kt}. The Rule-of-70 doubling applies to steady exponential growth in k. Double exponential growth also has the Rule-of-Minus-70 for halving in increment t. Even physicist Albert A. Bartlett (1923-2013) did not expect double-exponential growth when he stated that '***man's greatest failing is his inability to understand the exponential function***' [13]. The cause of the catastrophic collapse of Arctic ice sheets can only be from solar heating via basal icemelt. There is no other heat source large enough [3][4][5]. Atmospheric albedo effects are negligible. This calls into question the whole IPCC project focussed on land-air climate without regard to processes in 70% of Earth's sea surface.

1.6 Double exponential Pacific Warming and Atlantic Net Cooling

The ocean heat pump warming and cooling temperature annual anomalies from the prior decade at Scripps Pier (SP) (32°N, 117°W) surface and 5m, Port Erin (PE, 54°N, 4.8°W) surface, and Central England (CET) air are shown Figure 4.

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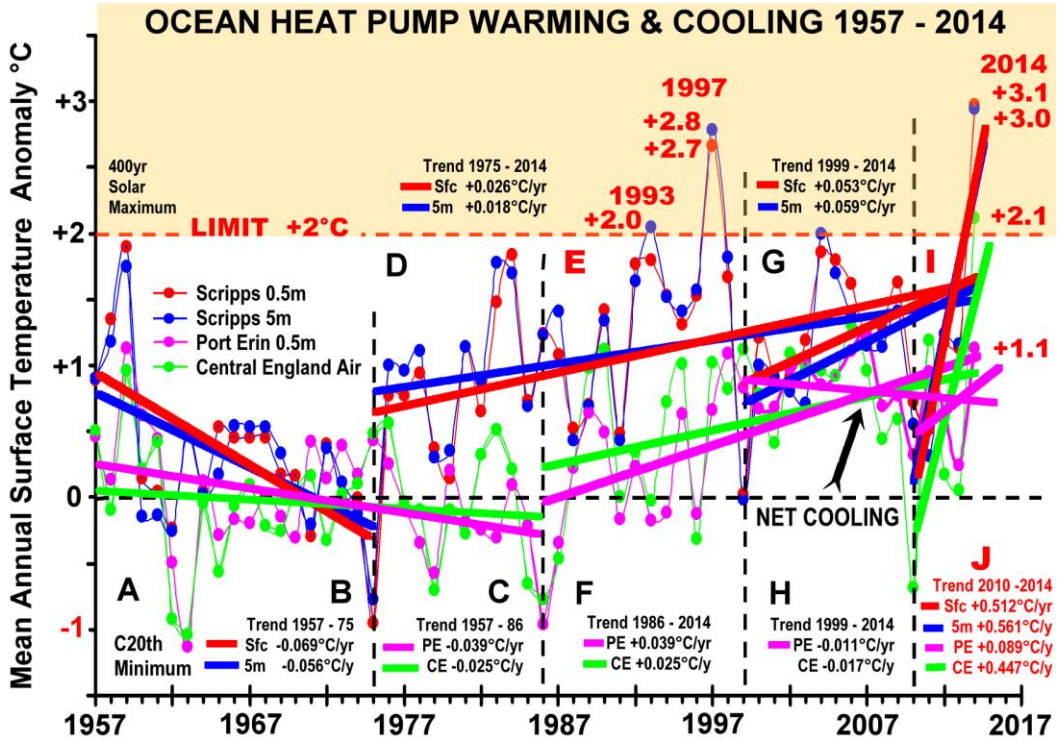

Fig 4: Ocean heat pump warming and cooling temperature annual anomalies from the prior decade for 1957-2014 at Scripps Pier (SP) (32°N, 117°W) surface (red) and 5m (blue), Port Erin (PE, 54°N, 4.8°W) surface (pink), and Central England (CET) air (green). (Data sources see [4][5])

Solar heat pump cycles referenced to Figure 1 show:

A) The solar heat pump upstroke of 1957 took 2 years to 1959 to reach extra-tropical locations. SP anomalies are higher (no Arctic cooling). At PE and CE, the 1963 downstroke is stronger due to additional latent heat of Arctic meltwaters. The 5½-year sunspot low reinforces meltwater cooling.

B) Scripps cooled in the ~20-years 1957-75 faster at the surface (-0.069°C/yr) than at 5m (-0.056°C/yr). There is no subsurface back radiation. It ended in an abrupt temperature up-shift on the 1976-1980 solar upstroke.

C) Port Erin and CE cooled in the ~30-years 1957-1986 at (-0.039°C/yr) and (-0.025°C/yr) respectively. It ended in an abrupt temperature up-shift on the 1986-1990 solar upstroke, one 11-year solar cycle after Scripps up-shift.

D) From 1975 SP warmed by overhead solar heat faster at the surface (+0.026°C/yr) than at 5m (+0.018°C/yr)

E) The proposed +2°C limit was breached at SP in 1993. The 1993 Matthews Point (Fig. 1) marks GHG heat trap dominance of ocean heating processes. Peak warm saline tropical water was observed 1992-6 at Port Erin [4][5]. Thereafter, tropical water had fresh warm layers similar to Pacific warm pools. The 1997 Scripps above-limit peaks of +2.8°C and +2.7°C were out of phase with solar input confirming GHG blanket dominance.

F) Port Erin and CE warm trends for ~30-years 1986-2014 were (+0.039°C/yr) and (+0.025°C/yr) regaining the ~1°C lost in the first period in C) above. Linear warming trend rates increased with each successive solar cycle.

G) Scripps warmed rapidly for 16-years 1999-2014 faster at 5m, +0.9°C (+0.059°C/yr), than at the surface, +0.8°C (+0.053°C/yr). This is clearly the ocean heat trap effect rather than relatively low-level solar input (Fig. 1).

H) For the same 16-year period Port Erin and CE net cooled -0.2°C (-0.011°C/yr) and -0.3°C (-0.017°C/yr). This is net cooling that misled climatologists and statisticians into claiming a global warming pause, hiatus or lull.

I) For the 5-year 2009-2014 solar upswing Scripps showed record +3.1°C (+0.512°C/yr), and +3.0°C (+0.561°C/yr). This rate is likely to continue to 2016 for warm water of 2014 to reach the sensors.

J) For the same 5-year period net cooling turned to slow warming with CE air at +2.1°C (+0.447°C/yr) and PE +1.1°C (+0.089°C/yr). Air with its 3000x lower heat capacity reacts more quickly than seawater.

1.7 Galapagos Islands North Pacific warming and Antarctic cooling

The Galapagos timeseries with the equatorial Pacific/Antarctic seasonal ocean circulation complement the Isle of Man Arctic/tropical system. The resultant biodiversity was studied first by Edward Forbes (1815-1854), and then by Charles Darwin (1809-1882) [14]. The Equatorial Undercurrent (EUC) supplies the Galapagos Archipelago with seasonal pulses of upwelled warm salty waters alternating with subsurface fluxes on the Peru-Chile undercurrent branch of the Humboldt Current [15]. The EUC was found at 140°W between about 2°N and 2°S at depths from 75 to 300 m where it is confined

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by wind-driven Ekman currents and upwelling [4][5]. The vertically elongated annular flow had highest currents ~140 cm/s and core >80 cm/s. Eastward transport is about 30 Sverdrups (Sv) [15]. Galapagos monthly mean SSTs have warm and cool season temperatures with increasing seasonality [16]. There is only a small net warming trend while annual rainfall has increased This is completely consistent with pulses of tropical and polar waters, and with higher evaporation from skin temperatures increasing at the Clausius-Clapeyron rate of about 7% per 1°C temperature rise (exponential doubling). It suggests a positive feedback mechanism of ~20% increased water vapor for +3°C rise supporting the rainfall observations.

Clearly double-exponential warming overwhelmed Antarctic ice cooling in the last solar upswing. June warming was ***above the proposed 2°C limit*** from the beginning of the record in 1965; ***overall warming in 1983*** (Figure 6). Net cooling from increased Antarctic icemelt shows in the decreasing June highs of +5.1°C in 1983, +4.3°C in, and +3.9°C in 2014. This is one sunspot cycle earlier than the 1993 Scripps high associated with the 1990-2 solar high. The 5-year 2010-2014 June rise is +1.8°C (+0.369°C/yr) and November at +1.1°C (+0.217°C/yr). This confirms overall 5-year warming.

Antarctic shelf-ice annual losses started about 1994, and are ~10,000 times smaller than Arctic losses. Antarctic 10-year losses increased exponentially from 25±64 km^3 per year 1994-2003 to 310±74 km^3 per year 2003-2012 [17]. Estimates from NASA satellite gravity data, show Antarctic glacier loss is increasing exponentially at ~147 km^3 per year since 2002. This suggests Antarctic exponential icemelt began about 3 years after the 2000 sunspot peak. It is consistent with the south Pacific Heyerdahl gyre period of ~6.5 years. South Pacific evaporative heat trapped is only half that of the north Pacific. The Antarctic is a land continent with fringing ice shelves; the Arctic all ice shelf. Ocean circulation drives warm surface waters away from the Antarctic but towards the Arctic. The Equatorial Undercurrent (EUC) is clearly the source of exponentially increasing June surface temperatures from western Pacific fresh warm pools.

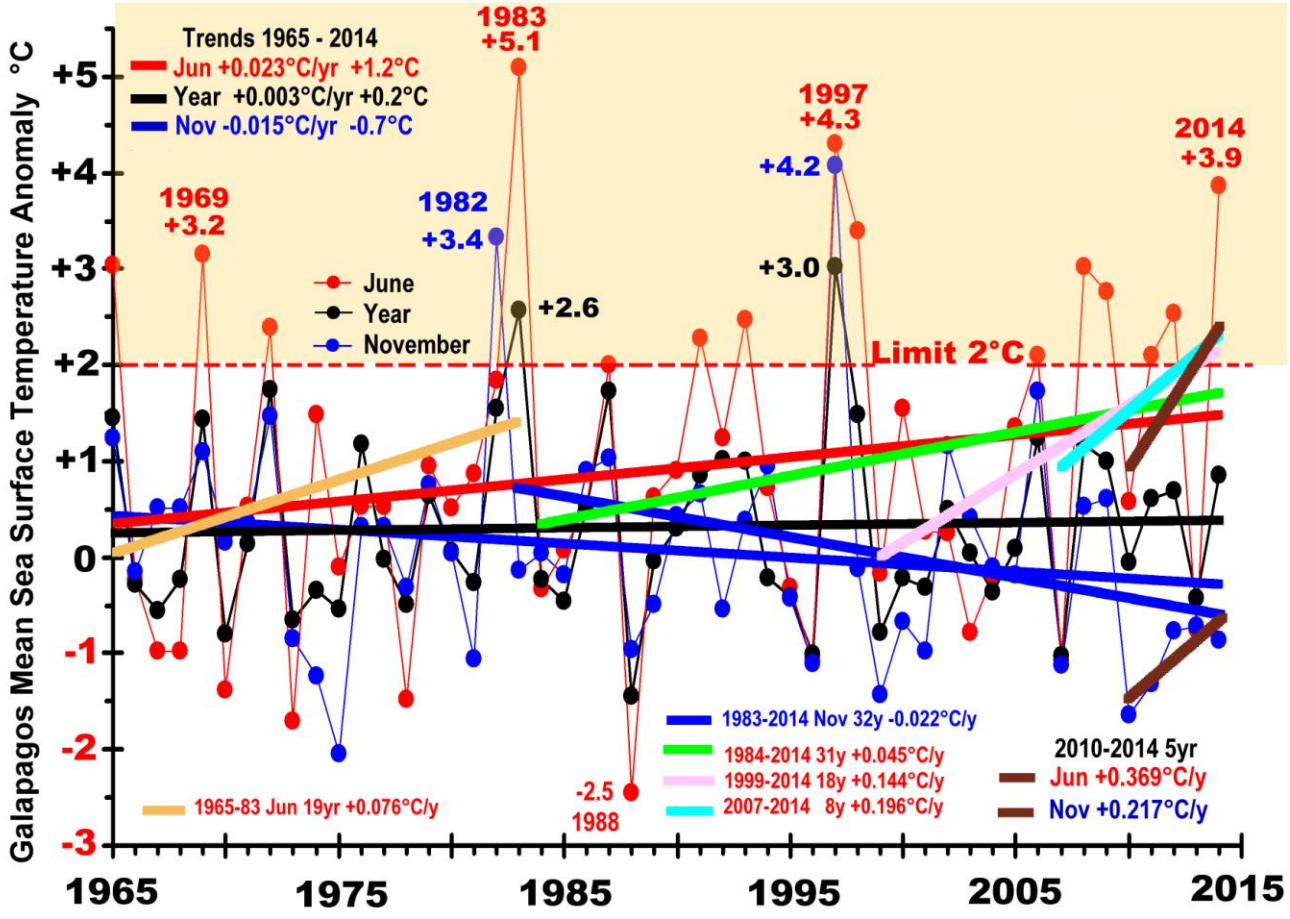

Fig 6: Galapagos Puerto Ayora (0.8°S, 90°W) mean sea surface temperature anomalies and trends 1965-2014 for June (red), year (black), and November (blue). Trends show small net warming (black) from exponentially increasing June warming for 1965-1983 (tan), 1984-2014 (bright green), 1999-2014 (pink), 1999-2014 (turquoise), 2010-2014 (brown), and modest November cooling (blue) becoming warming 2010-2014 (brown). Data from Darwin Foundation database, www.darwinfoundation.org/datazone/climate/ .

1.8 Equatorial Undercurrent (EUC) Ocean Conveyor is Not an El Niño Event

The +5°C EUC pulse observed in the months of February, March, and April 2014 are from the Western Pacific warm fresh pool (Figure 7, Data courtesy http://www.aoml.noaa.gov/phod/regsatprod/awp/index.php). This is the source of the extraordinary +3.3°C observed in Galapagos in June 2014 and Scripps +3.1°C at the surface and 5m. There appears to be a complete cycle of warm/cool EUC water across the Pacific from west to east. The EUC travels at >3.6 km/hr or 86

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km/day [15][4]. It is seven times faster than surface wind-driven gyre currents of ~11-12 km/day. Statistical climatologists issued Figure 7 as an El Niño or ENSO extreme event warning.

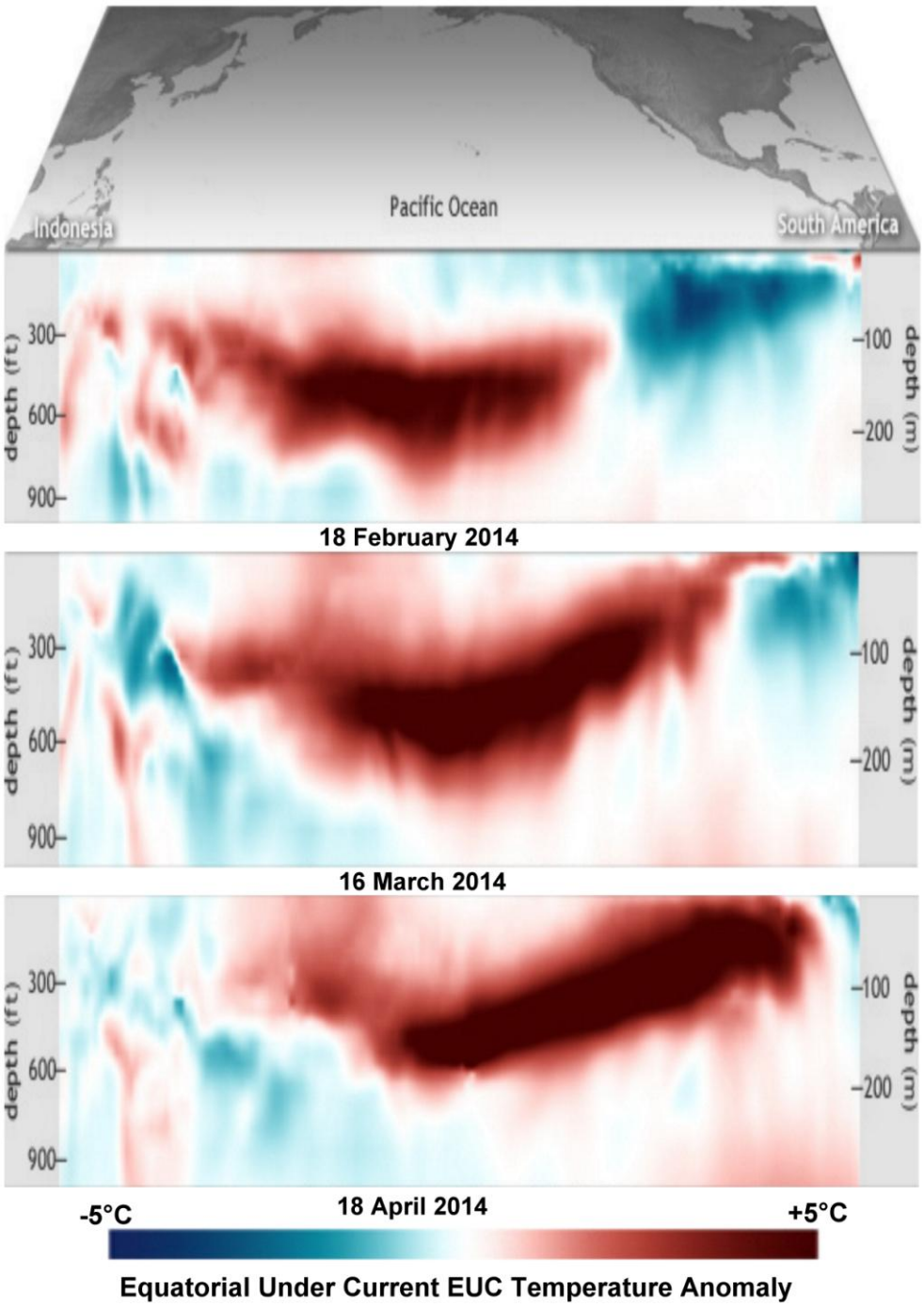

Fig 7: Equatorial Undercurrent (EUC) Seasonal water masses 120E to 80W 2014. (Data courtesy http://www.aoml.noaa.gov/phod/regsatprod/awp/index.php).

Instead of the forecast El Niño event, record +3°C temperatures were recorded throughout the North Pacific from 2013-2015 [18]. Surfers in January 2015 were disappointed with flat calm conditions from the becalmed Aleutian Low. The equatorial transect shows the EUC at mid-Pacific depths of 75-200m upwelling against the Galapagos Archipelago. The warm water originates in the western warm pool. It is carried on the Ebbesmeyer-Ingraham northern Turtle gyre to the North Pacific, and on the Heyerdahl gyre to the South Pacific. The new paradigm fully explains the processes [4][5].

1.9 Corroboration from 2014-2015 Sea Surface Temperatures

Global satellite SST records show the extraordinary warm +3°C water reported at Scripps, Port Erin, and the Galapagos, is a global phenomenon (Figure 8, from http://iridl.ldeo.columbia.edu, last access 25 May) [18][19]. Large marine and local coastal ecosystems are known to show seasonal warming and cooling resonant harmonic solar cycles [20].

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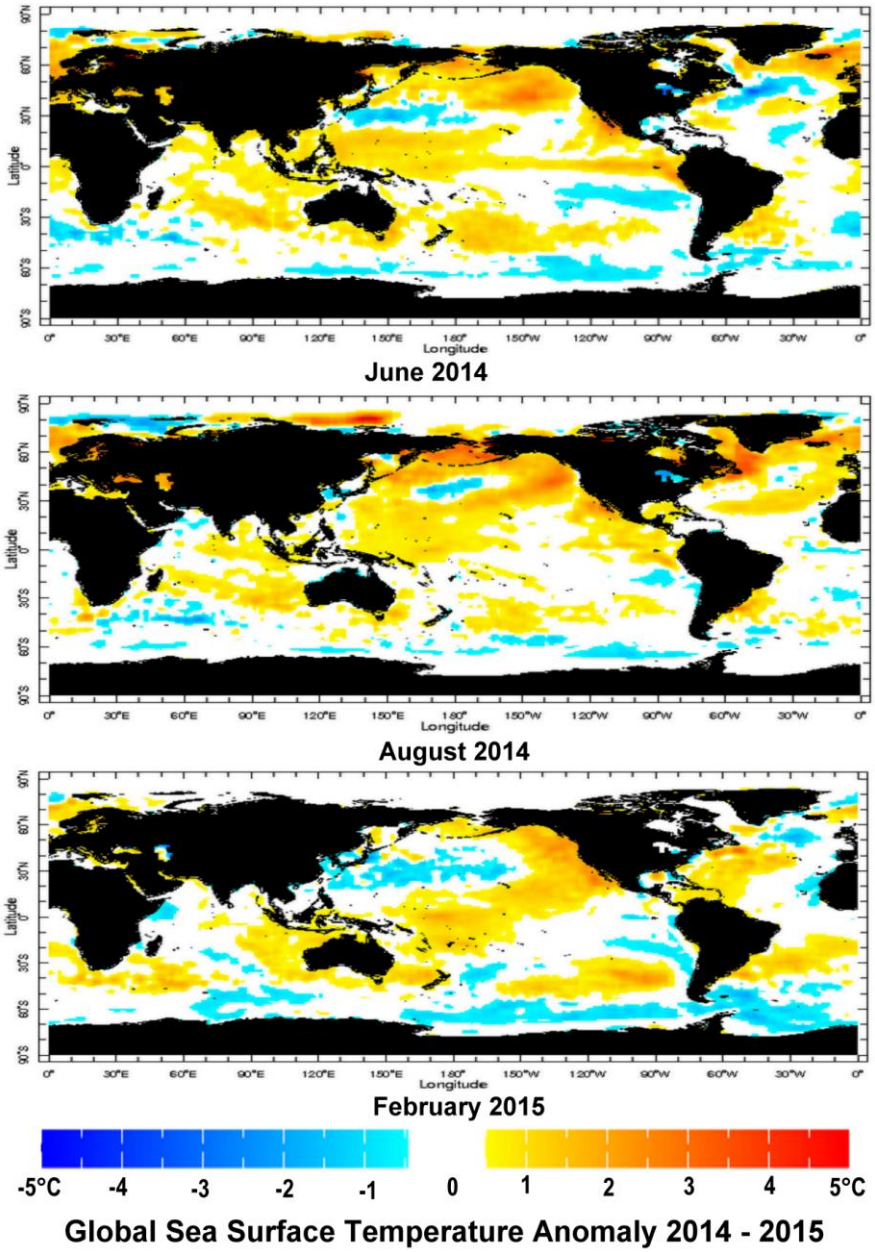

Fig 8: Global sea surface temperature anomaly June 2014, August 2014, and February 2015. Plots from Climate and Society, Columbia University, http://iridl.ldeo.columbia.edu.

The Galapagos 2014 June anomaly is also in the Gulf Alaska and In Bering Strait. The cold pulse from the China Coast Current and East China Sea into the warm Kuroshio Current and South China Sea is also visible In the north Pacific Aleut/Turtle gyre front [21]. The cold waters are clearly cold runoff from the Asian continent. They show the same warming and cooling synchronized to solar cycles as in Scripps and Galapagos data, i.e. cooling to 1976-7, rapid warming for 22 years then net cooling from 1998-9. Global frontal system walls between water masses of the same density but different temperatures were in the north Pacific, north Atlantic, and around Antarctica [20][4][5].

In August 2014 the warm anomaly is in the Gulf of Alaska, Bering Sea, Arctic Ocean, and in the Labrador current and north Atlantic. We related the abnormal 2014 summer warming to extreme weather, simultaneous tropical storms in the North Pacific and North Atlantic, super typhoons, and the displacement of the subpolar jet stream [5]. Cold Arctic air shifted through the central north American low-altitude pass via Alberta. It carried cold northern air into contact with southern warm air through most of the year. Tornadoes, floods, droughts, forest fires, and snow two months earlier than normal was the result. These are weather phenomenon rather than climate change. It is caused by double-exponential AGW heat blanket dominance over solar cycle heat pump input.

In February 2015, the warm anomaly is still strong off the North American coast. The warm north Pacific caused the loss of winter surfing and the 200m thick warm fresh layer in the Gulf of Alaska [18][19]. Climatologists name 'blob' does not describe the physical processes as Ebbesmeyer snarks – 10 km x 1 km x 1 m layers - so easily does [5]. The cold North China Sea water spread across the Aleut gyre from Taiwan Strait forming a north Pacific front. Unusually warm water is

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seen off the eastern Australian coast and south Pacific. At this time super-typhoon Pam devastated Vanuatu while another lingered over the northern Barrier Reef coast. Record floods over Australia were so extreme they lowered global sea levels by 3 mm in 2012 [5]. This is confirmed higher southern hemisphere evaporation.

1.10 The Solar Heat Pump, GHG heat trap and Central England Air Temperatures

The solar harmonic heat pump and the GHG double exponential heat blanket are in two distinct phases: before and after 1850 (Figure 9). Upstrokes over several sunstroke cycles are followed by downstrokes to solar minimums

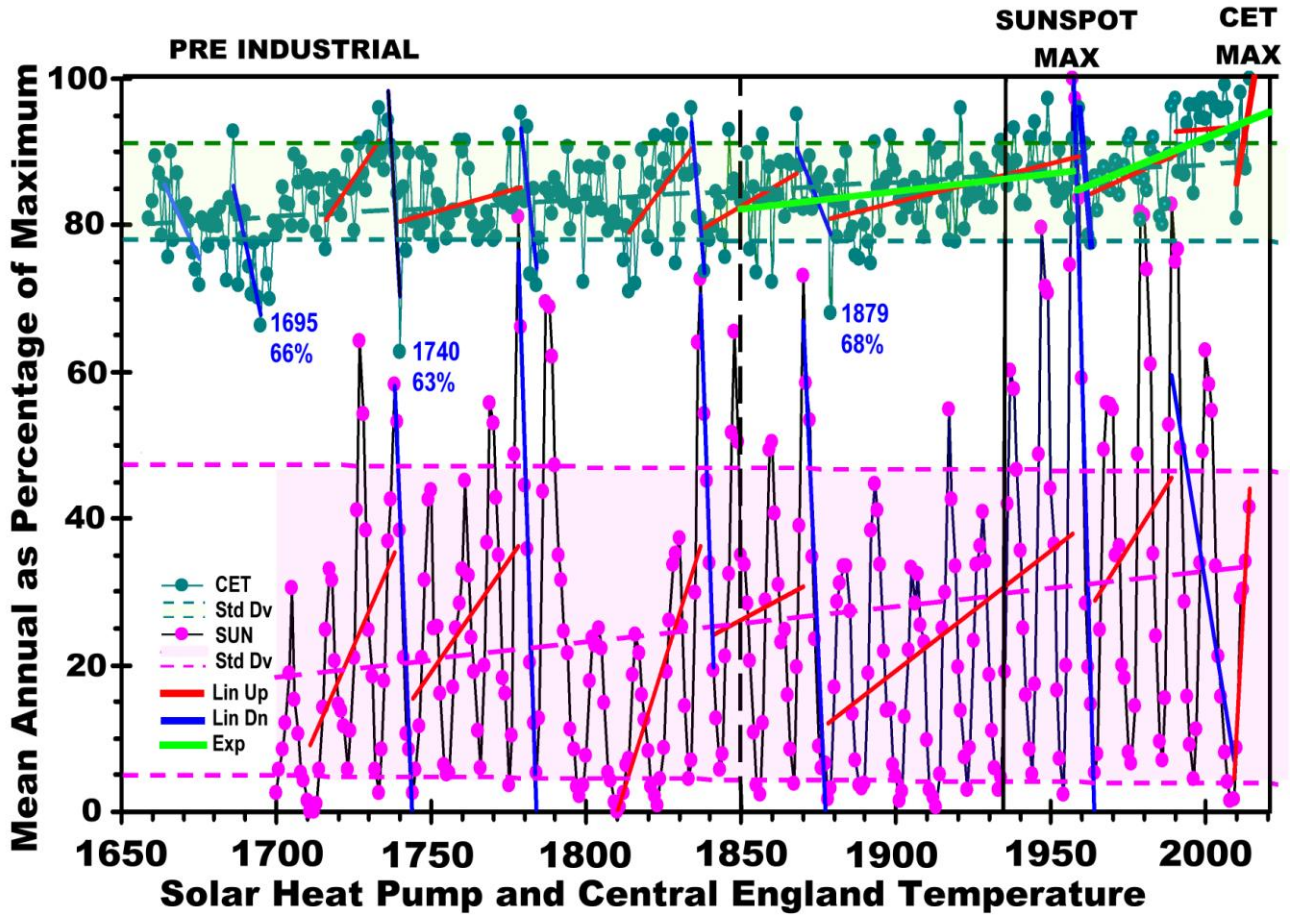

Fig 9: Annual sunspot numbers (red) and Central England air Temperatures (CET) (green) as percentage of maximum with one standard deviation from long-term means shaded and trend lines dashed.

The 192-year 1659-1850 pre-industrial period has an overall log trend of 1.0002. The period includes the Maunder Minimum 1630-1721, and part of the 1721-1923 Solar Regular Episode. It extends about 100 years after the beginning of the industrial revolution. CET highs and lows are evenly distributed above and below one standard deviation. The lowest temperature was 1740 63% at 6.8±6.3°C. It followed 28-year 1711-1738 sunspot rise. The sunspot high was not unusual. The 1777 154-spot 81% peak was the highest before the 1957 20th century maximum. Sunspot numbers are not well understood. However, this suggests unusually large sunspot numbers may occur about 200 years apart. The next CET low was in 1879 at 68% 7.4±5.2°C in the industrial GHG era. It was 140 years after the 1740 low and 185 years after the 1695 66% 7.3±5.0°C low.

The 108-year 1850-1957 period is the GHG double-exponential dominant period with overall log trend of 1.0005. It includes the 20th Century Solar High 1923-2008, and 1957 Sunspot Maximum [5]. The Port Erin 1904-2014 daily sea surface timeseries confirms the harmonic relationships. There is a 21-year 1989-2009 solar downstroke after the last 20th century solar maximum. Unlike previous strong downturns in solar radiation, the corresponding CET reversed to a tiny 21-year 1990-2010 trend rise of +0.0038°C/yr total +0.1°C. This confirms solar radiation is less dominant than the heat trap.

The 77-year 1957-2014 CET log trend is 1.0011, and the 5-year 2010-2014 is 1.0032. The 5-year linear trend was 0.3026°C/yr for trend rise +1.5°C. This is conclusive verification of the GHG double-exponential warming over shorter intervals. There can be no doubt that the sunspot synchronized ocean resonant heat absorption and warming is now dominated by double exponential AGW in the ocean surface layers.

Warming is now increasing at more than half a degree per year in the north Pacific. At the Isle of Man and Galapagos, net cooling has now turned to warming. Since the heat is already in the equatorial ocean at the sunspot peak in 2014, we are confident that warming will continue in the next two years and is very likely thereafter.

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2 The Physics of Climate Change Ocean Surface Paradigm

The physics of climate change ocean surface paradigm comprises three parts. The first is the equatorial ocean heat trap, the second the crosswind and downwind components of wind-driven ocean circulation, and finally the eleven interconnected counter-rotating synchronous gyre system.

2.1 The Pacific Asymmetric Meridional Ocean Heat Trap

The asymmetric Pacific ocean heat trap is shown in Figure 10 [4][5]. Equatorial evaporative-brine of salinity >36.4‰ and >28°C, floats subsurface under fresh warm layers thickening westwards. The meridional profile shows the brine sinking below ~200m polewards of latitude 15° (Figure 10 Inset). It is thicker in the hypersaline southern hemisphere. Annual freeze-brine is created in high latitude buoyant surface layers at salinity <24.7‰ and temperature <4°C. This is the buoyant lid that protects from heat loss while allowing year-round subsurface melting from warm subsurface layers. Dense brine of salinity >40‰ and temperature –1°C, sinks rapidly to abyssal depths [22]. However, downward thermal diffusion takes centuries and millennia [23][24]. There is no convective upwelling in seas heated from the top. Heat loss is limited to skin back radiation, and limited upwelling in the top few meters under sustained winds [25]. It is clear that seasonal oblique-angle albedo effects on the 10% of sea ice above sealevel are negligible by comparison with basal melt.

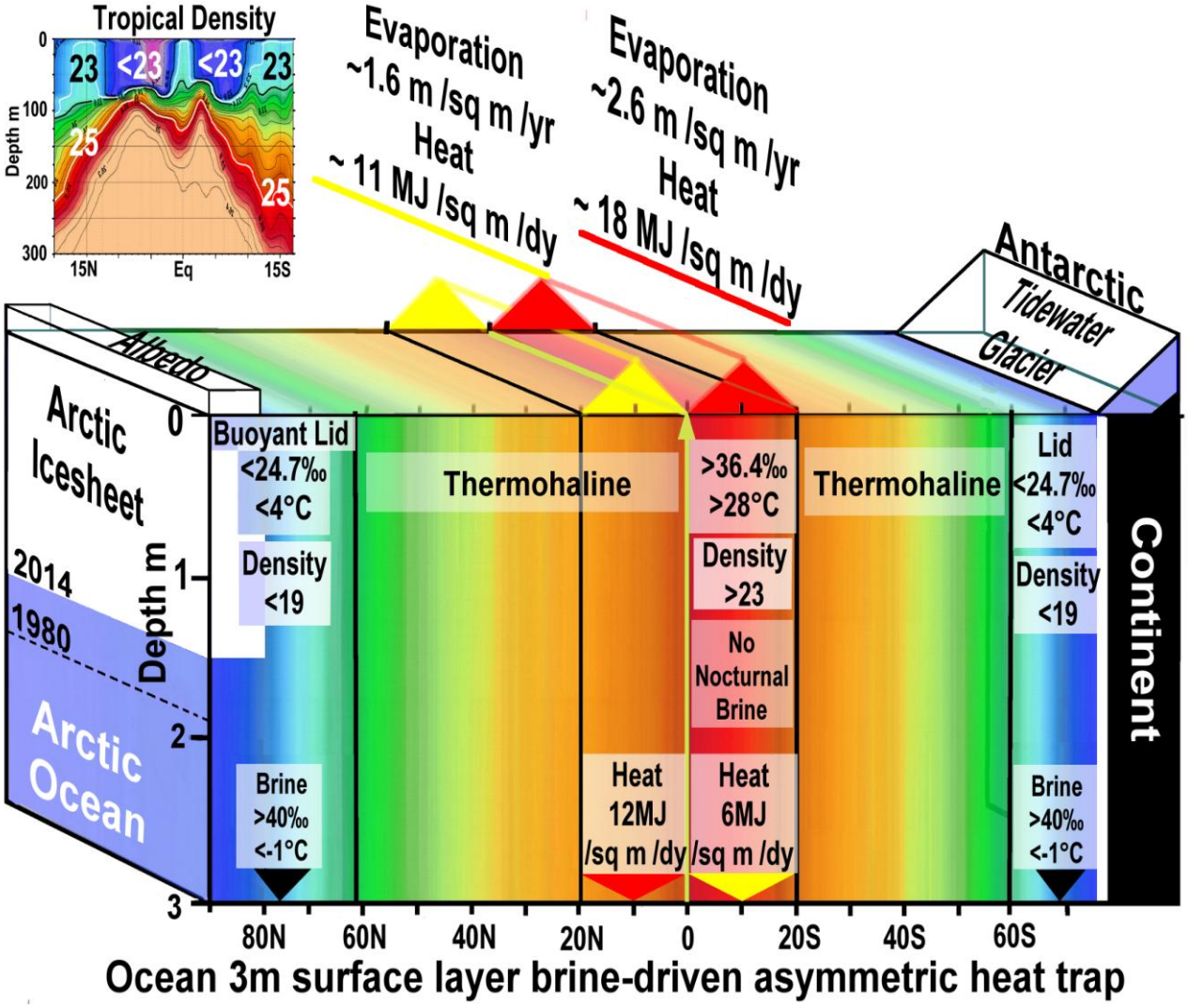

Fig 10: Pacific Ocean meridional 3m surface layer brine-driven asymmetric heat trap from Arctic to Antarctic. Inset is the 300m meridional density profile from 17°N-17°S from May 2008 [4].

2.2 The Pacific Ocean Wind-driven surface transport system

Surface winds cause boundary layer drag that decreases exponentially with distance away from the boundary and rotate under the influence of Coriolis effect on a rotating Earth. Usually only the Ekman components at 45° to wind direction are considered. The critically important log law surface drag is in the top 3m at 3% of windspeed and 3-4% to right (Northern Hemisphere) or left of wind direction (Figure 10). Divergent trade winds along the equator are primary drivers of the system.

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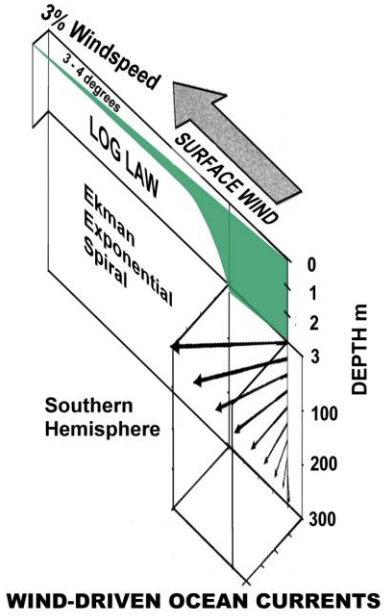

Fig 10: Wind-driven Ocean Currents to 300m.

The downwind and crosswind components are shown in Figure 11. About 6% of the downwind flux is carried in the upper 3m. This is the surface layer that traps heat asymmetrically and restricts heat loss. Cross-wind currents reverse direction below 75m. This is an important feature of the heat transport system. To 75m crosswind currents carry 30% of downwind fluxes to the right or left of wind direction. It drives Antarctic circumpolar water northwards as well as the warm equatorial water from north of the equator. This is the reason the heat transport is towards the north and accounts for differences in icemelt between the poles. Coriolis effect depends on the sine of latitude. It drives currents to the eastern ocean boundary at latitudes 45-55 (sines 0.7 to 0.8). The Antarctic northbound divergent surface currents start along the western continental boundary as in the Humboldt Current. In the northern hemisphere the crossover occurs at mid-latitudes in the Atlantic and Pacific. Frontal boundaries between gyre currents form between water masses of different temperatures but similar density [5]. The only North Pacific outlet is to the Arctic Ocean through Bering Strait to a depth of 50m. The flux is 50% of the downwind flux. The Gulf Stream/Columbus gyre carries the full downwind tropical water along the shelf break north of the English Channel at 50°N past the Isle of Man and into the Arctic Ocean.

Equatorial divergence and reversal below 75m confines the EUC countercurrent between 2°N and 2°S (Fig 11). It creates the annular flow discussed above. Similarly, Antarctic circumpolar winds carry ~25% of the downwind flow towards Antarctica below 75m depth. This is the source water drawn under Antarctic icesheets. A similar ~25% of the Humboldt-Peru-Chile current below 75m, south of the Equator passes, northwards to upwell against the Galapagos Archipelago.

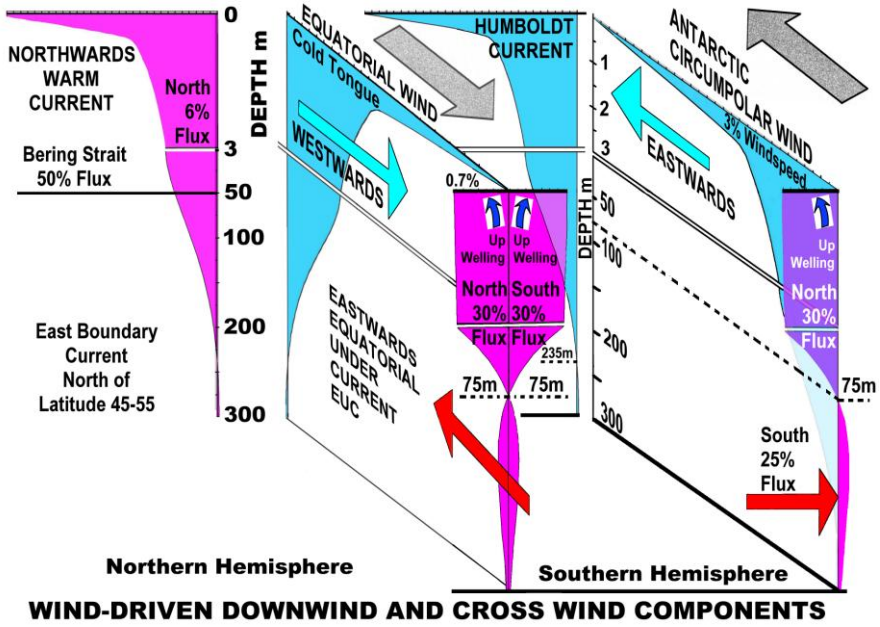

Fig 11: Wind-driven Logarithmic and Ekman Exponential Surface Currents Pacific Ocean schematic diagram.

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All these processes are consistent with the original Munk gyre and current wind-driven system under the influence of Coriolis effects on a rotating earth [26]. They account for seasonal warming and cooling pulses at the Isle of Man and the Galapagos.

2.3 The Global Wind-Driven Surface Transport System

The verified Ebbesmeyer gyre system of eleven counter-rotating surface gyre currents is schematized in Figure 12. The key location is Port Erin Isle of Man (A). It is clearly at the junction of the Arctic meltwaters and equatorial warm water. The Galapagos (B) is already a world heritage site but has no independent fully funded permanent active university-level research and teaching site dedicated to monitoring global warming impacts. These two are ideal sites to monitor the equatorial and Antarctic contributions. Scripps Pier (C) has an oceanography research and teaching facility attached to the marine biology observatory. With very little expense our work may be extended and verified.

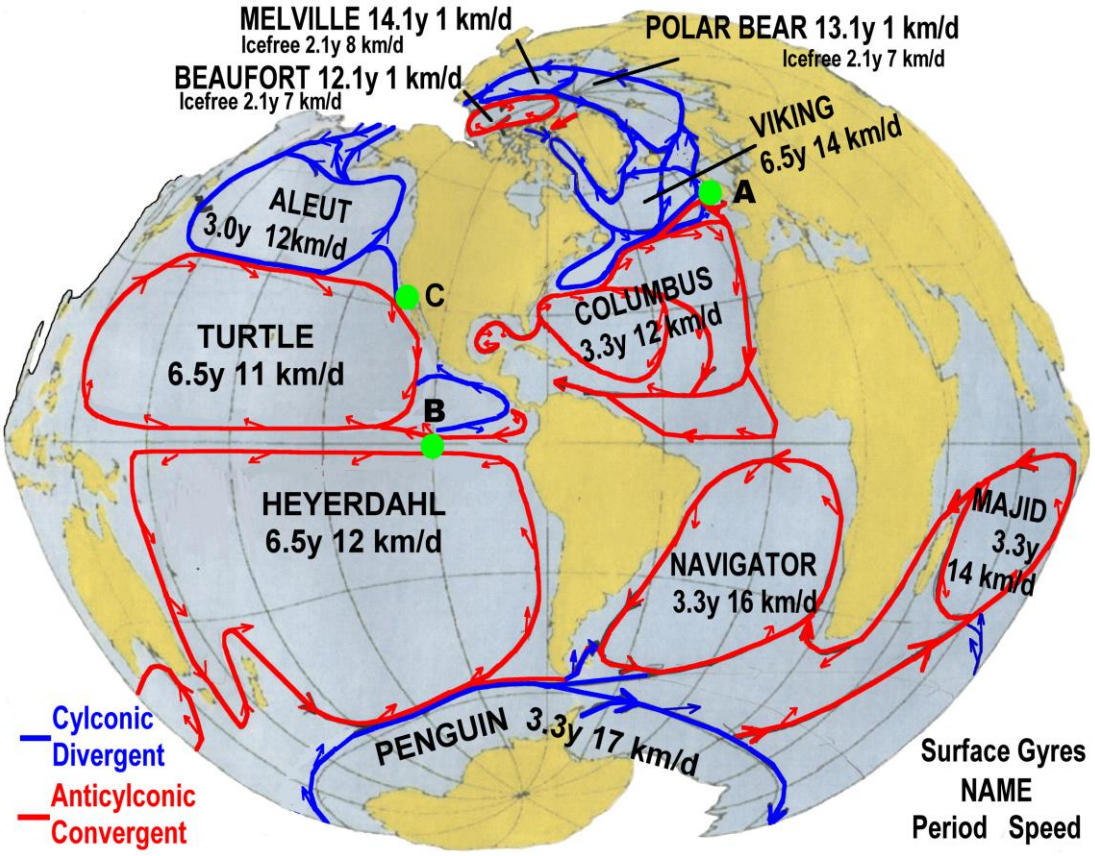

Fig 12: Enhanced Ebbesmeyer convergent (red) divergent (blue) gyres, periods and speeds in relation to Isle of Man and Galapagos (green) on an equal area chart projections.

Further field verification of the Ebbesmeyer gyre system is urgently need. The Ebbesmeyer-Ingraham computer model is the best verified of all air-sea interaction models [4][5]. It combines surface pressure fields with geostrophic currents in the top 200m. Much more detail of daily 10m profiles of temperatures and salinity at fixed ocean locations would enable details of the total heat transport to be monitored. The model is only verified for the north Pacific with relatively sparse geostrophic data. There is a clear need for many more experiments with calibrated drifters in the other oceans. This gyre system accounts for the major ocean garbage patches, and known water, heat and nutrient transport processes.

3 DISCUSSION

Catastrophic exponential climate change is dependent on the solar heat pump, the greenhouse gas heat trap and the ocean surface layer. Climate studies omit the crucial ocean surface covering over 70% of earth's surface and accounting for 93% of retained heat. Ocean heat absorption in the top meter is best measured along coasts where the largest impacts of extreme weather are felt. Fortunately we have over a century of daily records from the Isle of Man with the unique seasonal pulses from the tropical Atlantic and meltwaters of both Pacific and Atlantic origin. Galapagos data confirm that net cooling by meltwaters concealed exponential warming. Daily records of sunspots and carbon dioxide show double-exponential warming now controlled by the GHG heat trap accelerating even during solar minimums. Scripps data show the asymmetric warming in the North Pacific exceeded proposed limits of 2°C as early as 1993 and are now dangerously accelerating at more than half a degree per year. North Pacific temperatures of +3°C are likely to exceed +4°C by 2016.

Port Erin surface records are key to understanding and monitoring global ocean warming. The 2-year lag for equatorial water to reach the Island gives advance warning of unusually warm weather. The record 2014 solar maximum heat, as seen at the Galapagos SST, will arrive at the Port Erin in August 2016. Thus, both 2015 and 2016 will have higher

summer temperatures. We may expect toxic plankton blooms and potential shell fishery closures in both years. Since the GHG heat trap dominates over solar input and increasing double-exponentially, we can expect warmer summer seawater temperatures for subsequent years for the foreseeable future. This is a soundly physics-based prediction unlike the unverified El Niño and global conveyor-based forecasts.

The 5½-year lag from solar maximum to Port Erin cold water at solar minimum is also a proven forecast mechanism. The record equatorial highs of summer 2014 will appear as meltwater spring lows in 2020 in harmony with the solar cycle. The unusual cold temperatures in spring 2015 are the result of equatorial warming at the beginning of the 2008-2014 solar GHG-dominated upstroke. The Manx TT (Tourist Trophy) motorcycle races are held in June because this was a reliable 6-week period with warm dry weather in 1904. Now, over a century later, the huge volumes of cold spring Arctic meltwaters extended the cold season into the TT fortnight [3]. Isle of Man (Ronaldsway) air temperatures in May 2015 were ~2°C cooler than in 2014. We may confidently forecast for the next 5 years late Manx springs and cold TT fortnights. Local communities understand and respond to environmental change better from correctly analyzed local ground-truth data.

Port Erin surface data needs immediate expansion to include continuous depth profiles of temperature, salinity, and nutrient sampling from a purpose built pier with a fully-staffed laboratory and competent independent researchers and scientist managers. The meteorological and subsurface data needs incorporation into improved weather forecast models that include verified ocean surface processes. Variable grid boundaries could be very useful in reducing computational turbulence inherent in existing nested models. The network requires improvement to the five Met buoys around Ireland with two in the Irish Sea western fjord [3]. At present they only record sea surface temperatures and have no useful ocean profile data. They could be maintained from Port Erin. It is an all weather port that with improved quays could be an invaluable asset in maintaining data collection and research. This could be accomplished quickly without great expense and free of political bureaucratic control. The Author regrets that he was unable to discuss this with his mentor and friend John Mason (1923-2015), former Director General of the UK Met Office, and lifelong friend fellow student Peter V Hobbs (1937-2006). Our paper *Physics of Climate Change* [5] was complementary their *Physics of Clouds* and *Ice Physics*.

Aristotle (358-322 BC) wrote that geophysical catastrophes are soon forgotten in only one of two generations [27]. Populations succumbed to floods or volcanic events without trace. Survivors migrated and soon forgot. He would certainly have known the greatest geophysical event, the Santorini Thera volcanic eruption, that destroyed the ancient Greek Minoan and Mycenaean civilizations, Noah's flood, and the global Mappa Mundi showing a world ocean circling all land [28][29][30]. He would certainly have known of Motya the port of the Phoenicians, expert in seafaring, navigation, astronomy, shipbuilding and metal work [31][32]. He would know it was founded at the time of the Thera eruption but forgotten after its destruction in 397 BC [33]. We only know of the Antikythera portable astronomical clock attributed to Aristotle because Roman plunder was lost at sea [34][5]. Moreover, Aristotle also stated the scientific principle of experimental verification is essential in natural philosophy. Later Roger Bacon (1214-1292) in his Opus Major of 1267 re-iterated it, stating: "The strongest arguments prove nothing so long as the conclusions are not verified by experience". Climate scientists have condemned the world to catastrophe without regard to historic precedent. Basic physics knowledge was neglected, unverified beliefs imposed, and scientific field verification abandoned in only two generations.

3.1 How Climate Scientists Missed the Physics of Climate Change

In this era of mass communications, online libraries and great universities, so much has been lost in so short a time by so many. Climate studies confuse heat with temperature, do not include basal icemelt, Clausius-Clapeyron evaporation exponential function of skin temperature, asymmetric brine-heat sequestration, solar and tidal pumping, infra-red heat trap exponential growth, vertical tropical cells, freshwater warm pools; or wind-driven surface currents at 3 percent of windspeed.

3.1.1 Basal icemelt and tropical evaporation

The principles of the solar heat pump and the Tyndall atmospheric gas trap were established by the 19th century. Lyell (1854) discussed basal icemelt, icebergs from Baffin Bay in the Azores and from Antarctica off South Africa [27]. He reported Humboldt's observations that annual evaporation and rainfall increases from equator to pole. The values are consistent with observations: at the equator 96in (2.4m), in latitude 45° 29in (0.7m), and in latitude 60° not more than 17in (0.4m) [27]. Our equatorial measurements of 1.6m and 2.6m dependent on both temperature and salinity are completely consistent with this. However, a recent peer-reviewed paper in an AGU journal imposed wind-speed dependent evaporation on 43 equatorial 1m temperature and salinity datasets [35]. A plot of derived evaporation less supposed precipitation showed a completely uniform 24-hour evaporation alongside the strongly diurnal temperature signal. On this basis evaporation at midwinter midnight in the stormy Labrador Sea (60°N) will be higher than that at the midday Equator. Using such absurd and demonstrably wrong assumptions it is hardly surprising that IPCC researchers and modelers cannot come up with verified forecasts of climate change.

3.1.2 Ocean overturning conveyor with land-air assumptions and without Coriolis effect

Thomas Stocker, Swiss IPCC physicist, is a leading proponent of the absurd ocean circulation system that ignores Coriolis effects, misuses land-air evaporation dependent on windspeed, and cannot account for vertical circulation in a stratified ocean heated from above and thus without convection [37][36]. He dismissed our proposed verified paradigm in a personal communication (in German) via a lifelong physicist friend. The unverified ocean conveyor circulation system was invented for paleo-oceanographic purposes on thousand-year timescales [38][39]. Water Munk (1917-) published in 1950 the classic paper on the global circulation system of five wind-driven gyres and western boundary currents under Coriolis effect, a function of the sine of the latitude [26]. Our paradigm extended it to include surface drift currents.

3.1.3 The Wrong Assumption of a Well-Mixed Ocean Surface Layer.

All oceans and seas have a stratified surface layer. The assumption of a well-mixed 10m surface layer is a remnant from G. I. Taylor (1886-1975) from work on the Newfoundland Grand Banks in 1913 following the Titanic disaster [40]. He investigated boundary layer influences on icebergs. The air-land boundary layer approximations of eddy viscosity and eddy diffusion were devised to neatly avoid the complexity of turbulence [40]. The approximations only relate to fluxes over the land-air boundary on Salisbury Plain. Taylor expected to publish a similar treatment for the air-sea boundary. Ekman published first as shown enhanced in figure 10. However, Taylor's Newfoundland approximations of a well-mixed 10m, and substitution of sea surface temperatures (SST) for marine air temperatures (MAT) uniquely applied to this particular region with a strong freshwater ice-bath layer. They are misused by climatologists ever since. All are invalid.

Taylor was a Newton-Hooke experimental scientist and, like the author, a keen sailor especially in coastal shelf seas. He would no doubt discover the truth of the ocean boundary layer from in situ experiment as we did [1][2]. Like everyone else however, Taylor was not infallible. He did publish papers containing errors. The Author pointed out to him that he had used $2T/r$ for the surface tension of falling raindrop breakup bubbles in air. It is $4T/r$ for the inner and outer surface, where T is the surface tension and r the radius of curvature. Taylor readily acknowledged the error and said he would correct it in future publications. Taylor would be as alarmed as the Author at the continued mis-use of land-air approximations at sea.

3.2 Exponential Geophysical Knowledge Decline

The astonishing decline in verified fundamental climate physics knowledge in only two generations resembles the Ekman spiral (Figure 10). It confirms Aristotle's observation that geophysical disasters are soon forgotten. Climatology, like economics and astrology, is a statistical based study. They rely on correlations without proven causality. That is not the scientific method. Nominally climatology is classed under geophysics branches of meteorology and oceanography because the Navier Stokes equations prescribe the dynamics of both fluids. However, the errors setout above derive from 1) lack of classical physics knowledge, and 2) failure to verify assumptions through experimental field data.

3.3 Topsy Turvy University Model

Universities have been turned upside down in a master-slave relationship with bureaucrats controlling key men. Universities since the time of Aristotle were seats of learning with time and freedom to think, and teaching at the feet of key men [30]. Ten workers were needed to support one senior experienced natural philosopher teacher. Now, teaching is low priority and performed mainly by poorly paid untenured graduate students, postdocs and adjunct faculty (http://en.wikipedia.org/wiki/Professors_in_the_United_States last access 2 June 2015). In 2015 adjunct professors, hired for their low cost only, rather than expertise, make up more than half the teaching faculty at United States universities. They have been called the "working poor". Their intellectual property has been sequestered and sold as highly profitable commodities with scientists receiving no rewards. Experimental science is poorly taught from elementary school upwards. Political control perpetuates the disastrous education system.

Two generations of climatologists grew up under this unethical, unscrupulous system. UK had a world-class elementary to tertiary education system in science, mathematics and humanities in a brief window from the 1940 Butler Education Act to the 1967 Brain Drain report. Subsequently, professor-student mentorship and fieldwork was abandoned in favor of computer studies. It is now thought that the internet is substitute for individual teaching by accomplished scientists. While it is true that wikipedia contains full details of Clausius-Clapeyron evaporation, for example, it is clearly not sufficient. There is no substitute for lifelong learning directed by top-level scientists dedicated to teaching at the highest possible level. by regular hands-on experiments over a long periods. In 2005, the University of East Anglia Environmental Geophysics program was rare in teaching a full range of courses based on the Navier Stokes Equations with a multiplicity of fieldwork. Even there coastal oceanography was weak. The Author gave his extensive coastal and estuarine library to bolster the program. Supplementary courses such as the SEA Semester (www.SEA.org) are essential for understanding the broad, complex, diverse field of near-surface marine science. Anyone managing climate change should take such courses as key priority over any other qualifications.

Corporate university administrators demand world-class competitive rewards but have no world-class expertise (www.thetimes.co.uk/tto/education/article4053911.ece, Print Ed, Times, London, p12 4 April 2014). They show no understanding of how real science discovery works. They disregard the vital pedagogic university function. Pauper professors, in the 90th percentile of comparative professions according to the US Labor Bureau, must continually seek external funding or 'soft money' to satisfy corporate greed. They repeat failed models to produce multiple publications, often multi-authored, that rarely add value to student education, nor advance science. They are often misleading and wrong as detailed above. Student evaluation is by far the best basis for judging value-added teaching and pedagogy. Much lower priority should be placed on research paper valuation. When used, best practice awards 2 points for single author papers, 1 point each for dual, and zero for all others. It is not possible, even after decades, to evaluate the worth of real scientific discovery. Discoveries usually are made by the single or joint authors working and thinking independently with security of tenure for long periods without interference or external pressures. Technology is confused with science. Separate community technology institutions are the proper place for applied research.

3.4 Unscrupulous Science Publishing

Scientists are unique in having their intellectual authorship rights stripped in favor of commercial publishers. Richard Smith of Imperial College traced unethical, unscrupulous medical publication back to fraudster Robert Maxwell of Pergammon Press, publisher of *Deep-Sea Research* [41]. The practice is now universal with even the largest science organization,

American Geophysical Union (AGU), demanding high fees for its taxpayer funded publications. The Publisher in May 2015 demanded undeserved payment for publications that the Author and colleagues had contributed to the AGU Coast and Estuarine Monograph Series to be available free of charge for posterity. Publishers have so little regard for content they place key diagrams in supplementary pages unnecessarily split into two pages [17]. Some papers have so many authors, to keep up multiple publication numbers, they just give a group title with no individual names [42]. These careless greedy corporate practices have brought science and scientists into disrepute. They are a major cause of climate ignorance.

3.5 Climate Crisis Needs Immediate Action

Climate science has become a monopoly atmospheric statistics-based study with disregard for the coastal or surface layer of oceans. A full ecological impact study can produce rapid results if properly managed with a multidisciplinary team [43]. Scientists, engineers, native residents, state and local officials and ecological modelers participated via regular meeting to direct and re-direct the project. University experts may be employed but managed independently for rapid results. The primary purpose is to discover real impacts as part of a team effort not for increased publication numbers or to aid academic career progress. New discoveries may be made and learning advanced, but that is not the main purpose. The principles have been successfully used in fisheries management for many years. Rapid ocean results are needed now. This will be best managed from a coastal location rather than from the mountains of Colorado or Switzerland.

4 CONCLUSIONS

We conclude that catastrophic double-exponential ocean warming due to fossil fuel green house gases has driven the world to the brink of imminent disaster. Net cooling lulled the world into ignorant complacency. The +3.1°C in the Pacific +1.1°C at Port Erin and +2.1°C central England air will be higher in 2015 and 2016. Extreme weather, droughts, floods, tornadoes, forest fires, hurricanes and super typhoons are likely to worsen. Scientists charged with monitoring the disaster have been captured and diverted by ruthless corporate greed, and science set back perhaps two thousand years. Skeptics, politicians, statisticians, those with stakes in the status quo, and established research censors obstructing scientific progress squabble in ignorance while the globe burns.

Exponential growth always ends in disaster. Double exponential growth gets there twice as quickly. The time for discussion is over. Every community must make provision for complete independence from fossil fuels. Those who amassed great fortunes and value free dissemination of scientific truth need to step up and fund data collection, monitoring, analysis, and mitigating alternatives for the dangerous new world order. The Isle of Man provides an ideal prototype location. Every day without ocean surface data collection, vital scientific truth of interest and concern to all populations is lost forever. Predictions are groundless without accurate continuous ocean surface data and competent scientists and engineers to act on them.

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