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Computer models against empirical evidence for Antarctic climate

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ABSTRACT

The latest paper by Rye et al. (2014) suggesting rapid sea-level rise along the Antarctic margins follows the paper by Bromwich et al. (2013) claiming central west Antarctica is among the most rapidly warming regions on Earth and the paper by McMillan M. et al. (2014) claiming increased ice losses from Antarctica. In all the cases, the claims are based on cherry picking and poor quality results aimed to shift the scientific debate away from the overwhelming evidence that Antarctica is not warming at all, as recognised even by the IPCC Fifth Assessment Report (www.ipcc.ch/report/ar5/). The papers by Bromwich et al. (2013) and McMillan et al. (2014) have been already discussed elsewhere[16, 17] and this work concentrates on reviewing the basis for the allegedly increasing rate of sea-level rise claimed by Rye et al. (2014), purportedly in response to an increased glacial discharge along the margins of Antarctica. It is shown that the present pattern for Antarctica is actually one of reducing temperatures and increasing ice with no reason whatever to propose sea level rise. The virtual reality of simplistic computer models once again fails to match the actual observational evidence.

THERE IS NO SIGN OF RISING SEAS, MELTING ICE OR WARMING TEMPERATURES AROUND ANTARCTICA

In normal scientific practice models are built to account for all the known features of a physical phenomenon and are than validated or disproved by testing against observations or experiments. In the case of Antarctica, measurements of temperatures and sea ice extent show quite the reverse of the warming derived by modeling, assisted sometimes by the use of dubious data. Recently the big picture of cooling in Antarctica has been re-interpreted by focusing on just one place, Byrd station, where a poor quality record was used to produce "*the most rapidly warming region on earth*"[2]. This result was achieved by ignoring all the other better quality stations in the area, which are in perfect agreement with the generally-agreed satellite temperatures and sea ice extent[17]. Another example of highly-selective data is the conclusion of McMillan et al. (2014) of increased ice losses from Antarctica detected by the CryoSat-2 mission which is based on only a 3- year old record of a satellite system estimating the ice thickness rather than the more precise ice surface area while neglecting measurement inaccuracies and consistency with other information[17]. Rye et al. (2014) allege that along the margins of Antarctica the sea-level is rising at an increasing rate in response to increasing glacial discharge. This assertion is based on modeling and conflicts directly with the general understanding (shared even by the IPCC [www.ipcc.ch/report/ar5/]) of lower temperatures and increasing ice cover. Here we contrast modeling with obser-

vational evidence using several recent papers and data as examples.

Rye et al. (2014) use a modeled result, the global mean sea level reconstruction, which conflicts with observed tide gauge measurements, to claim that the sea level along the edge of Antarctica is rising faster than everywhere else because of fresh water discharge."*The Antarctic shelf seas are a climatically and ecologically important region, and are at present receiving increasing amounts of freshwater from the melting of the Antarctic Ice Sheet and its fringing ice shelves[1, 2], primarily around the Antarctic Peninsula and the Amundsen Sea.... Here, we assess the effects of the freshwater input on regional sea level using satellite measurements of sea surface height (for months with no sea-ice cover) and a global ocean circulation model. We find that from 1992 to 2011, sea-level rise along the Antarctic coast is at least 2 ± 0.8 mm yr^{-1} greater than the regional mean for the Southern Ocean south of 50° S. On the basis of the model simulations, we conclude that this sea-level rise is almost entirely related to steric adjustment, rather than changes in local ocean mass, with a halosteric rise in the upper ocean and thermosteric contributions at depth. We estimate that an excess freshwater input of 430 ± 230 Gt yr^{-1} is required to explain the observed sea-level rise. We conclude that accelerating discharge from the Antarctic Ice Sheet has had a pronounced and widespread impact on the adjacent subpolar seas over the past two decades*".

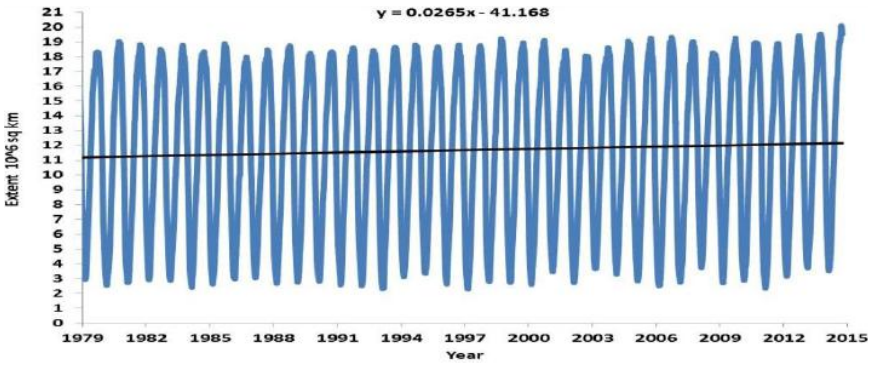
The recognition of the non-accelerating, periodic pattern of sea levels as recorded by tide gauges does not require any special skill. The lack of any acceleration of the absolute global mean sea level over the last 20 years, the period of satellite data, is very clear. It can be demonstrated by applying a linear fitting to the time series of the measured monthly average relative sea levels to compute the relative sea level rise velocity, and then computing the relative sea level acceleration as the rate of change of this velocity.

All the climate-related phenomena, and not just sea-level, change through time and exhibit repetitive patterns of behavior over decadal and multi-decadal periods[3]. Changes in the rate of global sea-level change are known to be influenced by a quasi-60 year rhythm related to oceanic internal variability[6, 4, 8, 22, 11]. Shorter constituents of quasi-20 years are also often relevant[20, 24, 11].

Because of the quasi-60 years oscillations, sea-level records longer than 60 years are required to identify any long-term trends that might appear in the data and properly assess velocities and accelerations[3, 11, 16]. Cherry picking of short time windows in selected locations may support almost any statement, from sharply accelerating to sharply decelerating sea level rise, or even falling sea level.

The latest PSMSL Table of Relative Mean Sea Level Secular Trends update 14-Feb-2014 (www.psmsl.org) proposes the relative rates of rise computed for 2133 tide gauges of variable record length (maximum 183, minimum 21, average 56.5 years) with the more recent, shortest readings collected mostly in areas of subsidence and a strongly non uniform geographical coverage. The average relative rate of rise of the 2133 tide gauges is 1.04±0.45 mm/year, but this number has very little significance[14]. By using only the 170 tide gauges of PSMSL extending over more s than 60 years at the present time, Parker (2014b) computed an average relative rate of rise of 0.25±0.19 mm/year. If we want to study the changes in the rate of rise of sea levels over the satellite altimeter era, we have to consider the 100 tide gauges of PSMSL with length of more than 80 years at the present time, i.e. more than 60 years of recording at the time the satellite monitoring started. Short records may overrate or underrate by almost an order of magnitude the actual rate of rise and therefore return completely unrealistic positive or negative accelerations, with only the first occurrences utilizedby the cherry-pickers[13].

The relative rate of rise of sea levels in these latter tide gauges is on average about the same now as 20 years ago. The average rate of rise for them is now 0.24±0.15 mm/year[14]. In addition, for these 100 tide gauges, the rate of rise has been rising and falling over the last 20 years without any sign of positive or negative accelerations. The average rate of rise for them was about the same in 1993. Therefore, the world wide average relative sea level re-



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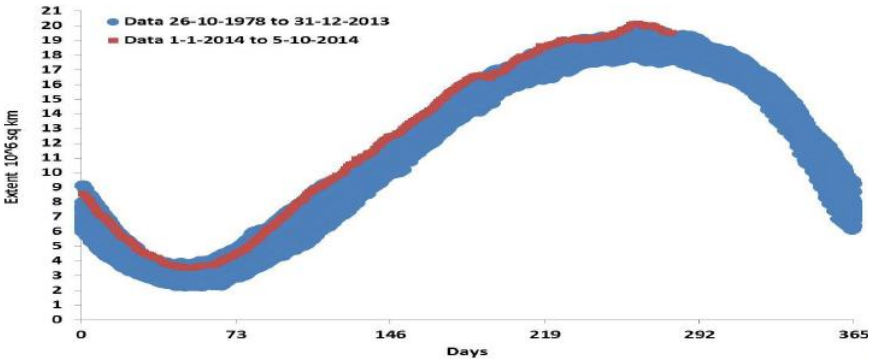

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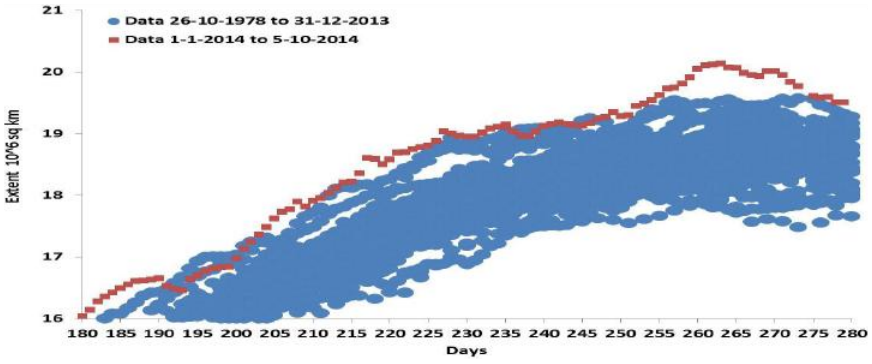

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Figure 1 : Sea ice extent vs. day and year (data from ftp://sidads.colorado.edu/DATASETS/NOAA/G02135/south/daily/data/ updated October 5, 2014 and downloaded October 7, 2014). Since the start of the recording in 1978, the sea ice extent has been growing at a rate of 0.0265 million square kilometres per year

sult derived from tide gauge of sufficient quality and length shows slow rising with no acceleration since 1993.

In addition to being acceleration free, these 100 tide gauges of PSMSL with a length of more than 80years at the present time show, on average, more subsidence than uplift. This is indicated by the velocity data from nearby inland GPS domes – when available - computed by SONEL (www.sonel.org) and/or JPL (sideshow.jpl.nasa.gov/post). Therefore, the absolute sea level rise velocity determined from the worldwide average tide gauge is probably smaller than 0.24 mm/year, not accelerating, and at least partly due to subsidence at the tide gauge. This result is in striking contrast to the global mean sea level determined from satellite altimeter-based computations and they cannot both be true.

The nominal satellite altimeter-based determination of the absolute global mean sea level is actually a computational result rather than a direct observation. It is obtained by correcting the satellite altimeter raw signal with algorithms having many

features in common with the climate models. Regardless of any modeling problems, Carter et al. (2014) pointed out that estimates of sea-level change from satellite-collected data remain problematic, because of the many uncertainties in data collection and processing. In particular, there is inconsistency between the results derived by different research groups, with all results depending upon the accuracy of complex adjustments some of which lack independent verification[7], plus the severe problem that the signal being sought may be less than the noise level of the data being used[10, 15].

Many corrections applied to all satellite altimeter measurements of sea-level since 2003 had the effect of changing a sea-level record that showed no trend or a gentle rise into one that projects high rates of rise[10]. The trend 1992 to 2000 was +0 mm/year. This trend was increased by 2.3 mm/year in 2003 and then by another 0.8 mm/year introduced in 2008 to make the present 3.1 mm/year[10].

Even without the corrections, the satellite altimeter results are unreliable. Processing of all satellite altimeter data takes place against the background of known errors that at least match, if not exceed, the sea-level signal being sought[1]. Fu & Haines (2013) showed that significant biases have existed for years, and must be accounted for in constructing the combined sea-level record. The long-term sea surface height (SSH) calibration time series for three satellite altimeter missions (Topex/Poseidon), Jason-1 and Jason-2) have, in addition to the common flat trend of the raw signal, significant SSH differences between one mission and another[5]. The two latter missions measured SSH too high by +9 and +18 cm, respectively. The bias represents errors in altimeter characterization data and misinterpretation of the mechanical reference point for the space crafts' altimeter antennae[5].

As concluded by Wunsch et al. (2007) the determination and attribution of global-mean sea-level change, at best, lies at the very edge of knowledge and technology with both systematic and random errors of concern. It is possible that the database is insufficient to compute mean sea-level trends with the accuracy necessary to discuss causes. Wunsch et al. (2007) clearly state that the priority has to be to make such satellite sea level calculations possible in the future. Meanwhile the IPCC AR5 admits that it is very likely that the annual Antarctic sea ice extent increased at a rate of between 1.2 and 1.8% per decade between 1979 and 2012 and Antarctic sea ice continues to grow (www.ipcc.ch/report/ar5/).

Antarctic Sea Ice Extent just set a new record breaking the 20 million square kilometres barrier on September 17, 2014 (wattsupwiththat.com/2014/09/19/antarctic-sea-ice-extent-sets-new-record-pierces-20-million-square-kilometer-barrier/). Coverage then peaked in September 20, 2014 at 20.142 square kilometres. This is the third year in a row that a record high has been reached and there has been a consistent average 1.5% increase each decade since records began in 1979.

Figure 1 presents the sea ice extent vs. day and year (data from ftp://sidads.colorado.edu/DATASETS/NOAA/G02135/south/daily/data/ updated October 5, 2014 and downloaded October 7, 2014). Since the start of the recording, the sea ice extent has been growing at a rate of 0.0265 million square kilometres per year.

Figure 2 presents the sea ice extent of Septem-

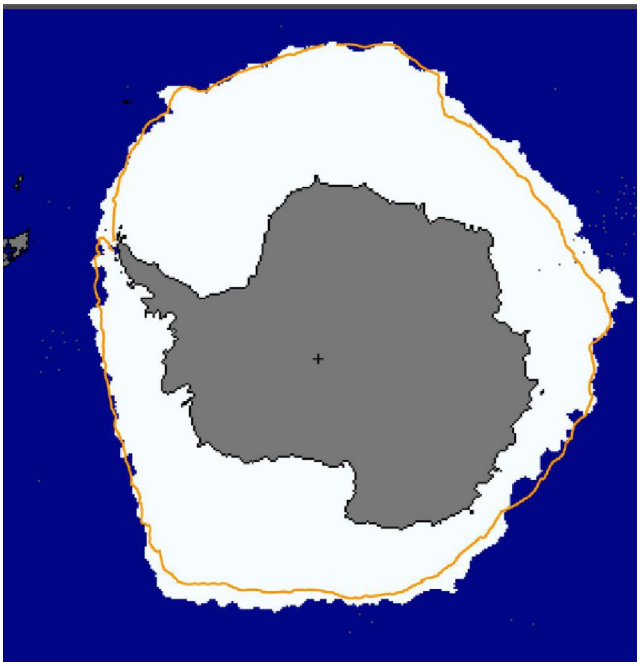
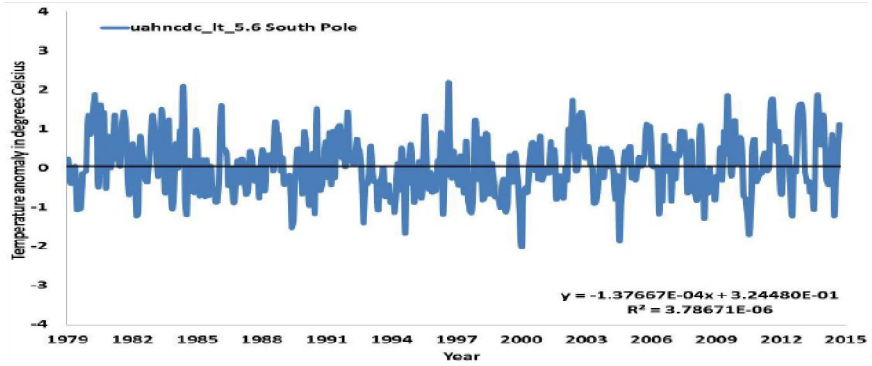


Figure 2 : Sea ice extent of September 20, 2014 vs. the median 1981-2010 in yellow. Picture downloaded from nsidc.org/arcticseaicenews/files/2014/09/Figure42.png on October 7, 2014. Since the start of the recording in 1978, the sea ice extent has never been larger



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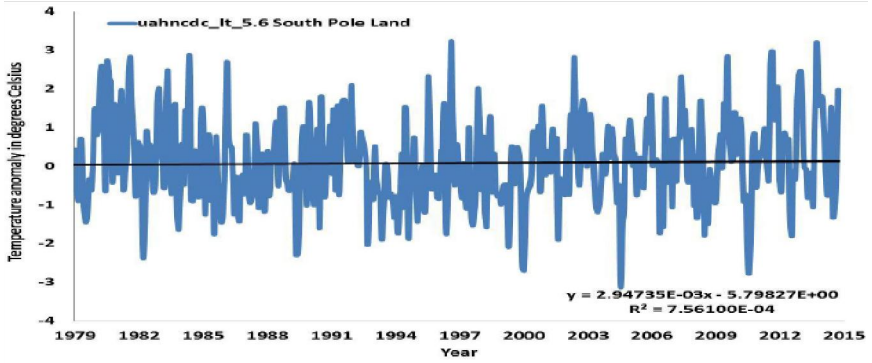

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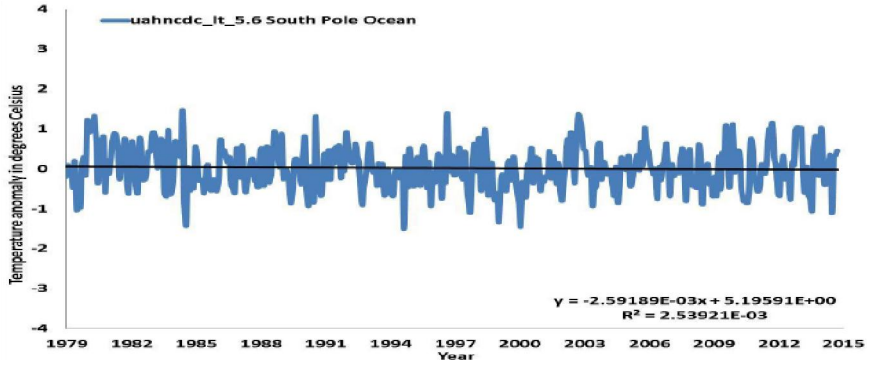

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Figure 3 : Temperature time histories for the Antarctic region, global, land and sea (data from www.nsstc.uah.edu/data/msu/t2lt/uahncdc_lt_5.6.txt, accessed October 10, 2014). The temperatures for Antarctica are cooling over the time window 1978 to present

ber 20, 2014 vs. the median 1981-2010 in yellow. Picture downloaded from nsidc.org/arcticseaicenews/files/2014/09/Figure42.png on October 7, 2014.

Figure 3 presents the temperature time histories for the Antarctic region, global, land and sea (data from www.nsstc.uah.edu/data/msu/t2lt/uahncdc_lt_5.6.txt, accessed October 10, 2014). Despite the fact that the time window covers 20 years of the upwards phase of a global quasi-60 years oscillation and only 10 years of the downward phase[11, 19] for Antarctica the surface temperature trend is of cooling.

Figure 4 presents the temperature time series for the MawsonStation (Australian Bureau of Meteorology Station Number: 300001; Opened: 1954; Now: Open; Lat: 67.60° S; Lon: 62.88° E; Elevation: 10 m, data from www.bom.gov.au/climate/data/index.shtml accessed October 10, 2014). It shows monthly values of average maximum and average minimum with 36 months average and linear trends, monthly highest and lowest values with 36 months average and linear trends and 36 months average

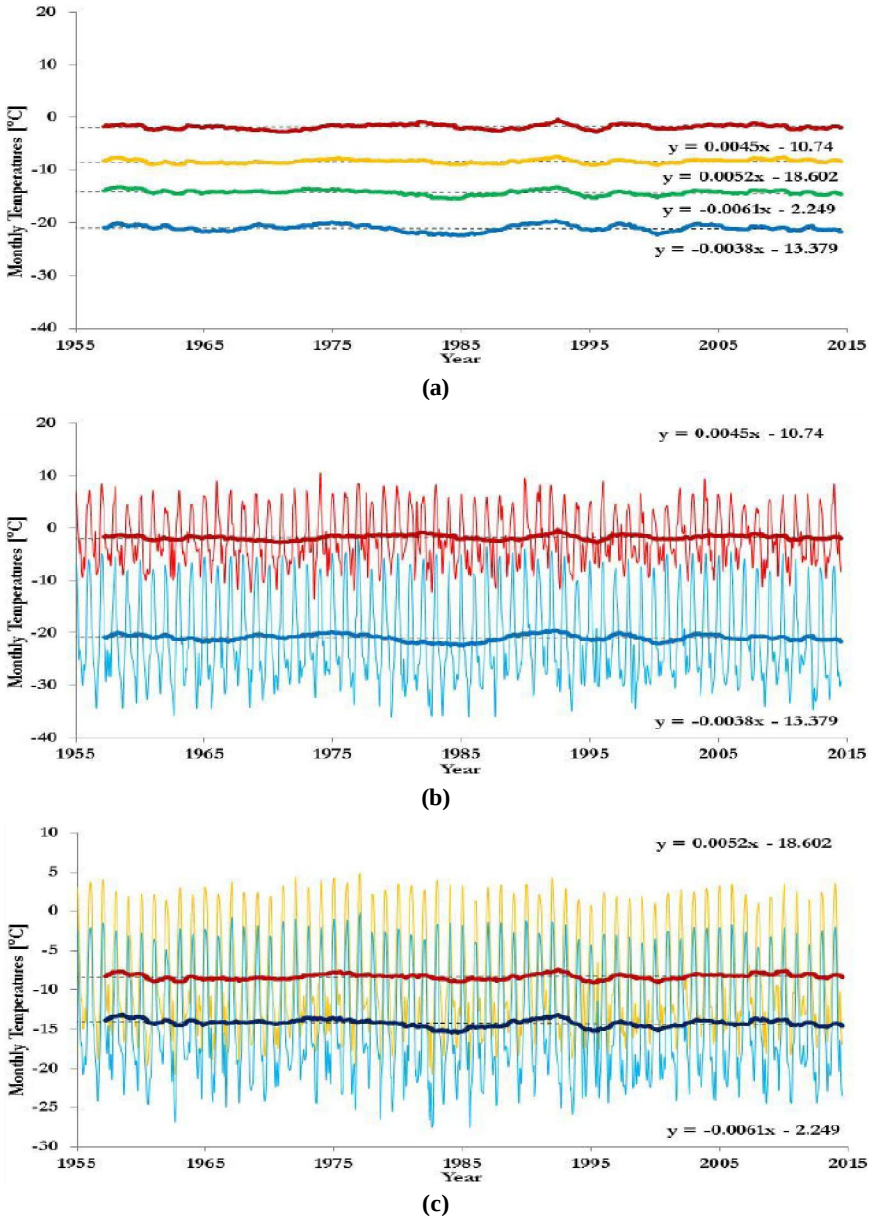

Figure 4 : Temperature time series for Mawson (Station Number: 300001; Opened: 1954; Now: Open; Lat: 67.60° S; Lon: 62.88° E; Elevation: 10 m, data from www.bom.gov.au/climate/data/index.shtmlaccessed October 10, 2014). a) monthly values of average maximum and average minimum with 36months average and linear trends; b) monthly highest and lowest values with 36months average and linear trends; c) 36months average and linear trends of monthly average maximum and minimum, highest and lowest. There is no sign of warming or increasing occurrences of extreme events

and linear trends of monthly average maximum and minimum, highest and lowest. There is no sign of warming or increasing frequency of extreme events. The temperature trends (in °C/year) are the following: Mean Maximum +0.0052, Mean Minimum -0.0061, Highest +0.0045, Lowest -0.0038, Average of Mean Maximum and Mean Minimum -0.0005. Mawson Station is one of three permanent Australian bases in the Australian Antarctic Territory of East Antarctica named after Antarctic explorer Sir Douglas Mawson. Established in 1954, Mawson is Australia's oldest Antarctic station and the oldest continuously inhabited Antarctic station south of the Antarctic Circle. The temperature record shows a significant stability leaving no space to warming claims for this location. This is even clearer when

considering that heat release and heat storage in the inhabited station may have biased upwards all the temperatures in the extreme weather conditions of Antarctica.

Explorer Douglas Mawson was not worried about global warming when his team landed on Antarctica on January 8, 1912 in fine weather. In contrast, after trying the same trip a century later, the "*group of scientists and paying members of the public*" led by Chris Turney were trapped by the unpredictable ice that should have been melted according to the models. Where Mawson found a bay with clear water, Turney found a bay choked with ice.

Most of the Antarctic continent is bounded by sea ice rather than fresh water. In these circumstances actual measurements of sea levels would have been rather difficult to perform, but it does not make too much sense to claim the sea level is rising while the sea ice is expanding and the temperatures are cooling.

The big research issue about Antarctica in particular (but about the climate in general) is why most of the climate papers in high impact journals such as Nature Geophysics completely neglect nearly all the observational data. They prefer models, which can be made to fit their pre-conceived idea of global warming.

DISCUSSION AND CONCLUSIONS

The claims of climate alarmists regarding Antarctica are based on cherry picking and poor quality data and processing, aimed to shift the scientific debate from the overwhelming evidence that Antarctica is not warming. For the claims published in Nature Geoscience and Geophysical Research Letters, no comment questioning these alarmist findings on the basis of more serious scientific approaches has been permitted.

Normal statistical treatment of real sea level data (rather than adjusted data) shows a slow rate of sea level rise that is no cause for alarm. The alleged high rate of sea level rise around Antarctica is an artefact of modelling. The increasing area of sea ice around Antarctica is a serious problem for warmist modellers, and a practical problem to those who had their ship trapped by ice because they trusted poor models.

In the science of global warming the past is regarded as dubious, and capable of improvement by '*adjustments*' to suit models: only the future is certain!

We suggest that priority should be given to real observed data, and data analysis should use standard statistical techniques. On this basis the future remains speculative, but so far there is no cause for alarm and the normal scientific method of observation – hypothesis – testing is retained.

REFERENCES

[1] Bar Y.Server et al.; "Geodetic reference antenna in space (GRASP) – A mission to enhance spacebased Geodesy", Jet Propulsion Lab., Caltech, Pasadena, ilrs.gsfc.nasa.gov/docs/GRASP_COSPAR_paper.pdf, **(2012)**.

[2] D.H.Bromwich, J.P.Nicolas, A.J.Monaghan, M.A.Lazzara, L.M.Keller, G.A.Weidner, A.B.Wilson; "Central west antarctica among the most rapidly warming regions on Earth", Nature Geoscience, **6(2)**, 139-145 **(2013)**.

[3] R.M.Carter, W.De Lange, J.M.Hansen, O.Humlum, C.Idso, D.Kear, D.Legates, N.A.Mörner, C.Ollier, F.Singer, W.Soon; "Commentary and analysis on the whitehead & associates 2014 NSW sea-level report", NIPCC Report Reference: E13.7268, September 24, **(2014)**.

[4] D.P.Chambers, M.A.Merrifield, R.S.Nerem; "Is there a 60-year oscillation in global mean sealevel?", Geophysical Research Letters, L18607. doi: 10.1029/2012GL052885, **39(18)**, **(2012)**.

[5] L.L.Fu, B.J.Haines; "The challenges in long-term altimetry calibration for addressing the problem of global sea-level change", Advances in Space Research, **51**, 1284-1300 **(2013)**.

[6] S.Holgate, "On the decadal rates of sea level change during the twentieth century", Geophysical Research Letters, L01602, Doi:10.1029/2006GL028492, **34**, **(2007)**.

[7] J.R.Houston, R.G.Dean; "Comparisons at tide-gauge locations of glacial is ostatic adjustment predictions with global positioning system measurements", Journal of Coastal Research, **28**, 739–744 **(2012)**.

[8] M.Marcos, M.N.Tsimplis, F.M.Calafat; "Inter-annual and decadal sea level variations in the north-western Pacific marginal seas", Progress In Oceanography, **105**, 4–21 **(2012)**.

[9] M.McMillan et al.; "Increased ice losses from Antarctica detected by CryoSat-2", Geophysical Research Letters, (2014), DOI: 10.1002/2014GL060111, **(2014)**.

[10] N.A.Mörner; "Sea level changes past records and future expectations", Energy & Environment, **24**, 509-536 **(2013)**.

[11] A.M.Parker, SaadSaleem, M.Lawson; Sea-level trend analysis for coastal management, Ocean & Coastal Management, 10.1016/j.ocecoaman.2012.12.005, **73**, 63–81 **(2013)**.

[12] A.Parker; "WHY global warming went missing since the year 2000", Nonlinear Engineering, **2(3-4)**, 129-135 **(2013)**.

[13] A.Parker; "Minimum 60 years of recording are needed to compute the sea level rate of rise in the western south pacific", Nonlinear Engineering, DOI: 10.1515/nleng-2013-0011, **(2014a)**.

[14] A.Parker; "Accuracy and reliability issues in computing absolute sea level rises", Submitted paper, **(2014b)**.

[15] A.Parker; "Persisting problems affecting the reliability of the satellite altimeter based global mean sea level computation", Pattern Recognition in Physics, http://www.patternrecognition-in-physics.com/pub/prp-2-65-2014.pdf, **02(02)**, 65-74 **(2014c)**.

[16] A.Parker; "Discussion of increased ice losses from antarctica detected by cryosat-2 - short periods of 3 years of data should not be used to infer any trend", Environmental Science: An Indian Journal, ESAIJ_2007, **9(12)**, **(2014) (2014d)**.

[17] A.Parker, "Pattern recognition of temperature trends for antarctica from linear and nonlinear regression analyses", Nonlinear Engineering, **3(3)**, 179–187 **(2014e)**.

[18] A.Parker; "Present contributions to sea level rise by thermal expansion and ice melting and implication on coastal management", Ocean and Coastal Management, **98**, 202-211 **(2014f)**.

[19] A.Parker; "The "present global warming hiatus" is part of a quasi-60 years oscillation in the worldwide average temperatures in the downwards phase", Environmental Science, ESAIJ_676, **9(1)**, **(2014g)**.

[20] D.Pugh; "Changing sea levels: Effects of tides, Weather and climate", Cambridge University Press, Cambridge, 265 **(2004)**.

[21] Rye, D.Craig et al.; "Rapid sea-level rise along the Antarctic margins in response to increased glacial discharge", Nature Geoscience, **7**, 732–735 **(2014)**.

[22] W.Soon, D.R.Legates; "Solar irradiance modulation of equator-to-pole (Arctic) temperature gradients: empirical evidence for climate variation on multi-decadal timescales", Journal of Atmospheric, Solar & Terrestrial Physics, **93**, 45–56 **(2013)**.

[23] C.Wunsch, R.M.Ponte, P.Heimbach; "Decadal trends in sea-level patterns: 1993–2004". Journal of Climate, doi: 10.1175/2007JCLI1840.1, **20(24)**, 5889–5911 **(2007)**.

[24] H.Yndestad, W.R.Turrell, V.Ozhigin; "Lunar nodal tide effects on variability of sea level, Temperature, and salinity in the Faroe-Shetland Channel and the Barents Sea", Deep Sea Research I, **55**, 1201–1217 **(2008)**.