

Request for Proposals - South Atlantic Storms

Background – South Atlantic subtropical/tropical systems have been an area of growing interest in the meteorological community in the last decade, largely due to the impact of cyclone Catarina in March of 2004 (McTaggart Cowan et al., 2006; Silva Dias, 2004) on the east coast of Brazil, its ‘unprecedented’ formation, and subsequent economic damage. Braun (2008) and Evans & Braun (2012) found a much higher frequency of such signatures (63 in a 50-year climatology) in the South Atlantic than previously thought, positing a link between storm counts and warm western boundary currents penetrating more poleward, supporting more deep convection. Pezza et al. (2009) specifically discuss Catarina in the broader context of climate change and variability in the western South Atlantic. They conclude that trends of declining wind shear and increasing SSTs in the region are correlated with the Antarctic Oscillation and the Southern Annular Mode (AAO and SAM, respectively), and that such trends lead to a more conducive environment for tropical transition (from other cyclone types) and even tropical cyclogenesis in situ. They develop a ‘South Atlantic Index’ which accounts for both blocking pattern and environmental vertical wind shear (EVWS). They further comment on the relationship between local SST and EVWS, regarding their high correlation in the tropics and subtropics, but stop short of answering the question of causality.

Excerpt: Pezza et al. 2009 - “Pezza and Simmonds (2005) [also] showed with an independent dataset that the windshear in the subtropical SA has been decreasing slightly during the satellite era.”

“The combination of increasing SSTs and slightly decreasing windshear, together with an unchanging MSLP pattern over the whole period of analysis suggests conditions increasingly favourable for TT development over the area.”

Figure 4 - Time series of windshear, SST and MSLP averaged for the Catarina box (20/35 °S, 0 °W/SA coast) for the months of March from the period 1958–2002.

Hurricane Catarina’s damage-induced insurance losses were reported at $425 million (U.S.), likely below the attachment points of most property catastrophe reinsurance contracts; however, it should be noted that an estimated 33,000 people lost their properties and over 80% of all homes affected received received damage to their roofs (Silva Dias, 2006, McTaggart-Cowan et al., 2006). It is unclear the level of insurance coverage before or following this event, or whether it had an effect on coastal building practices in the region. The unknown vulnerabilities in the emerging Brazilian market (Business Insurance, 2012), make this potentially developing threat from South Atlantic storms worth investigating for its increasing relevance to the (re)insurance industry.

The Risk Prediction Initiative (RPI2.0), part of the Bermuda Institute of Ocean Sciences, promotes productive dialogue between scientists and (re)insurers involved in catastrophe risk by refocusing scientific research towards answering the industry’s questions.

BIOS is an independent U.S. non-profit marine research and educational institute and Bermuda registered charity founded in 1903.
**Excerpt: Evans and Braun 2012:** “Significant weather associated with STs includes gale force winds and intense rainfall, so these systems can have major societal impacts in their own right.” “Possible impacts of climate change on subtropical, and even tropical, cyclogenesis in the South Atlantic remain an open question.”

**Excerpt: McTaggart-Cowan et al. 2006:** “Furthermore, the very existence of a tropical system in the South Atlantic Ocean motivates a reanalysis of conventional wisdom as it pertains to the development of hurricanes in climatologically large shear regions.”

**Questions, objectives and scope of work**
Enhance the existing Evans and Braun 2012 ERA-40 reanalysis and NCEP GFS operational analysis climatology with NCEP/NCAR Reanalysis, and potentially 20th Century Reanalysis data through 2012, including landfalls and losses.

Develop a stochastic event set of South Atlantic storms given the increasing favorability for their development (Pezza et al 2009), based on a) historical, b) current and c) medium term (5- to 10-year) climate representations and projections.

Investigate sensitivity of storm counts, intensity, size and landfall to climate variability through AAO and/or other climate indices (as suggested by Pezza et al 2008, and their South Atlantic Index).

Investigate sensitivity to broader scale phenomena – e.g. global average temp, local SST warming, ENSO. What do these systems’ MPI look like compared to ‘pure’ TCs?

Key components of this work will be:
- A final report that details the results of the analysis. The final report should stress the thinking and rationale supporting the techniques that were used to analyze and clean the primary data as well as the final analysis of the finalized data set.
- A dataset derived from the study which underpins any subsequent publications and/or code which may be used directly by RPI members prior to any resulting publication.

This work should be completed by June 2014. The successful scientist(s) should plan to attend an RPI Research Update Workshop in Bermuda in 2014, with a view to presenting the results. The successful scientist(s) may also be requested to attend other RPI Members functions.

Interested parties should submit a research proposal of no more than 5 pages that includes a budget. Proposals should be uploaded electronically via the following website: [http://rpi.bios.edu/proposal_upload/upload](http://rpi.bios.edu/proposal_upload/upload).

Previous RPI grant awards have generally been on the order of $50K/year. Award decisions are based on the scientific merit of the proposed research, the relevance of the research to the stated goals, development and availability of appropriate follow-on applications for our Members, and the dollar amount requested.

Further information on the RPI is available at [http://rpi.bios.edu/](http://rpi.bios.edu/). Submission deadline is **May 15, 2013.**
References


Business Insurance Emerging market: Brazil, What you need to know before entering the market - A Business Insurance White Paper, © Crain Communications 2012


