

## Dramatic effect of small scale SST South Atlantic features on the evolution of Hurricane Catarina

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The development and evolution of the first recorded South Atlantic hurricane (Catarina) in March 2004 is still attracting much interest (Pezza and Simmonds 2005, 2008, McTaggart-Cowan et al. 2006, Veiga et al. 2008, Pezza et al. 2009, Pereira Filho et al. 2010). One puzzle was as to why it evolved over waters with homogeneous (Reynolds) sea surface temperatures (SST) of 24°C.

Figure 1a shows the SST distribution in the region immediately before Catarina was formed on 19 March, overlaid with the future track of Catarina. Along the track all SSTs were below 26°C south of 26°S, and there is no strong evidence of mesoscale ocean features in the vicinity of that track.

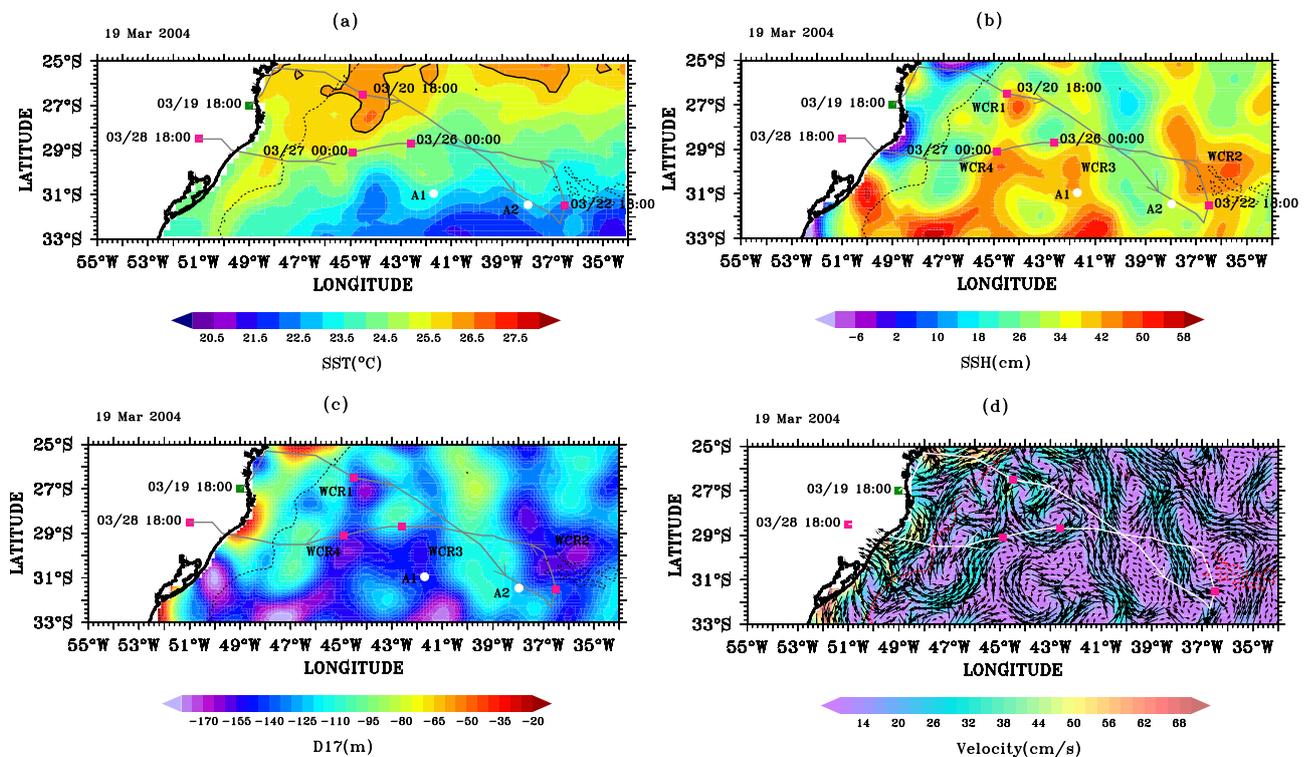
By contrast, the distribution of sea surface height (SSH) (retrieved from satellite altimeters) reveals clear eddy structures present under the future Catarina track (Figure 1b). The most notable are three 'warm core rings' (WCRs) in a ridge-like distribution located around 27–31°S and 40–45°W (WCR-1, WCR-3 and WCR-4), and an eastern WCR centered at 30°S–36°W (WCR-2). These 200–300 km features were present almost without change since the end of February 2004. Figure 2c shows the map of altimeter-derived 17°C isotherm depth (D17) on 19 March. WCR-1 to 4 have D17s at least 70 m greater than the background value of 100 m. (D17 is much shallower near the shelf slope, where it may be less than 30 m.) The final panel in Figure 1 shows the derived absolute geostrophic current field for 19 March. The mesoscale circulations show currents and eddies with speeds of 30 cm s<sup>-1</sup> in the open ocean, and southward flows of up to 40 cm s<sup>-1</sup> well inside the continental shelf.

Our analysis supports suggestions that high resolution SST of central importance in accounting for hurricane formations and development. We present in Vianna et al. (2010) a comprehensive analysis of the extraordinary Catarina system.

### References

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**Figure 1:** SST, SSH, D17, and geostrophic currents on 19 March, 1 day before the onset of the Catarina storm, overlaid with the future centroid track of Catarina: (a) Reynolds SST exhibiting only one tongue with 26°C over a background of lower temperatures south of 27°S. (b) The SSH data showing the complex ocean topography featuring four main WCR signatures traversed by the track, with two nearby Argo floats at positions A1 (over WCR-3) and A2 away from any WCR. (c) D17 subsurface isotherm. (d) The mesoscale absolute geostrophic currents (small vectors refer to less than 10 cm s<sup>-1</sup>). Red squares denote daily storm center positions, and dotted line is the 1000 m depth isobath.