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A close look at a severe mesoscale convective system surrounding the Air France 447 crash

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On 1 June 2009, the Air France (AF) flight number 447 crashed in the tropical Atlantic Ocean between 02:00 and 02:15 UTC. An analysis of the severe Mesoscale Convective System (MCS) surrounding the AF 447 flight could provide some insights. No study, to our knowledge, has looked at the degree of severity of the cloud top features associated with this specific MCS. Although we do not engage in any discussion concerning the causes of the AF 447 crash, we will present results that highlight the severeness of the MCS when the accident occurred.

In order to investigate the degree of severity of the MCS cloud–top features and its weather characteristics, we have used the multispectral data of Spinning Enhanced Visible and Infrared Imager (SEVIRI) onboard Meteosat-9 based on detection of overshooting tops. Two SEVIRI water vapor (WV) band images (6.2 μm and 7.3 μm) and the SEVIRI thermal infrared (IR) band images (10.8 μm) provided information about the structure and the microphysics of the MCS cloudiness. While the Meteosat-9 (Meteosat Second Generation, MSG) measurements do not directly provide information on vertical motions, we focus on the combination of water vapor and infrared window channels to depict overshooting tops at these MCS's as proxies for convective intensity.

Analysis of the difference between the water vapor and the infrared brightness temperature reveals unique details on the severity of the MCS formed in a line west-east across the flight path. WV–IR differences larger than +3.0 °C are associated with deep convective clouds (overshooting clouds) that have a large amount of ice and strong updrafts. Several overshooting tops cooling below -80 ºC were found in our analysis. These were associated with a severe MCS cloud cluster on the route of the flight. A striking feature is that this cloud cluster resulted from the merging of four smaller clusters with cloud top temperature that reached -81°C – this cloud structure could potentially be responsible for the extremeness of the MCS.