

## **Understanding variability across the Crossroad transect from 3 years (2013 to 2015) of hydrographic data**

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### **Abstract**

The southwest continental shelf of Africa is characterized by a strong western boundary current with three interdependent components, namely the Agulhas Current, Agulhas Retroflection and Agulhas Return Current. This system plays a key role in setting oceanic conditions south of Africa. The Crossroad transect intersects both the Agulhas Current and Agulhas Return Current; a monitoring line established in 2013 to sample both the currents and determine inter-ocean fluxes, as well as the influence of the Agulhas Current on the Agulhas Bank shelf. The objective of the study was to examine both mesoscale and submesoscale features that influence the dynamic and variant nature of the Agulhas system. In this study we make use of Ship board Acoustic Doppler Current Profiler (SADCP), Conductivity Temperature and Depth (CTD), Thermosalinograph (TSG) and satellite Sea Surface Height data as main observations for analysis. The study also examines both the spatial and temporal characteristics of water properties across the Crossroad transect. The fundamental findings of the study include the abundance of both the mesoscale and submesoscale features observed in the Agulhas system, which are often overlooked. In addition, a noticeable variability in current measurements was observed, where velocity ranging from 2 to 2.5 m/s represented the Agulhas Current and 1.4 to 1.7 m/s, Agulhas Return Current. Similarly, the position of the Agulhas Current and Agulhas Return Current displayed variation from 2013 to 2015, with the Agulhas Return Current exhibiting a meandering pattern in 2014 along the transect. Furthermore, an intrusion of cool (8 to 13 °C), fresh (34.8 to 35 psu) South Indian Central Water masses were also observed along the Agulhas Bank. The ability to combine altimetry and in situ data also contributed to the analysis of the results. Therefore, given the inherent advantage of satellite and in situ measurements, an

overview of the variability across the Crossroad transect was determined.