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Multi-sensor (SeaWiFS/MODIS/AVHRR) surface signature of the Azores current

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The Azores current (AzC) separates colder and fresher Eastern North Atlantic Central waters from warmer and more saline Subtropical waters. The cross-frontal temperature gradients reach as much as 1 ^{o}C per 50 km and play leading role in formation of cross-frontal horizontal density variations in the upper 600 m layer. During the cold season the AzC is well seen on Sea Surface Temperature (SST, in ^{o}C) satellite (MODIS and AVHRR) images. During the warm season the frontal interface at the sea surface is effectively disguised by formation of a strong seasonal thermocline. This puts serious limitation on the investigation of this front/current system using thermal infrared (IR) waveband imagery. As an addition to thermal IR and altimeter (Sea Surface Height or SSH) data, we propose to use Ocean Colour (OC, in mg Chl a m^{-3}) MODIS and SeaWiFS images to study the Azores front/current system. Our results show that OC visibility of the AzC front greatly depends on e.g. seasonal trends in plankton productivity cycles to the north and south of the front (with a frontal interface more/less well pronounced during spring/winter months, respectively) and on cloud coverage, with at times prevents full visualization of the frontal region. The frontal interface of the AzC is traditionally determined by an outcrop of the 18 ^{o}C isotherm. However, our results show the AzC OC frontal interface in surface waters is co-located with the 18.5 ^{o}C isotherm. The AzC OC frontal interface differs from dome-like vortex structures and elliptic elongated Rossby waves anomalies. It can be identified as an asymmetric zonally stretched band of maximum surface Chl a over

the frontal zone accompanied by a relatively sharp Chl a decrease to the south. Analysis of all years of OC data suggests that topography plays also an important role in AzC spatial variability, with increased biological activity being observed in the frontal zone region. High negative correlation (>0.95) between the thermocline depth and the surface Chl a in the Azores frontal zone, suggests that in this region Chl a distribution is greatly subdued to water dynamics all year round. This investigation suggests that OC imagery can be an important supplement to SST and SSH data in investigation of ocean dynamic variability, making it possible to locate (thermal-biological) frontal zones with great precision.