Ocean Sci., 12, 495–506, 2016
www.ocean-sci.net/12/495/2016/
doi:10.5194/os-12-495-2016

Wind changes above warm Agulhas Current eddies

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Abstract

Sea surface temperature (SST) estimated from the Advanced Microwave Scanning Radiometer E onboard the Aqua satellite and altimetry-derived sea level anomalies are used south of the Agulhas Current to identify warmcore mesoscale eddies presenting a distinct SST perturbation greater than to 1 _C to the surrounding ocean. The analysis of twice daily instantaneous charts of equivalent stabilityneutral wind speed estimates from the SeaWinds scatterometer onboard the QuikScat satellite collocated with SST for six identified eddies shows stronger wind speed above the warm eddies than the surrounding water in all wind directions, if averaged over the lifespan of the eddies, as was found in previous studies. However, only half of the cases showed higher wind speeds above the eddies at the instantaneous scale; 20% of cases had incomplete data due to partial global coverage by the scatterometer for one path. For cases where the wind is stronger above warm eddies, there is no relationship between the increase in surface wind speed and the SST perturbation, but we do find a linear relationship between the decrease in wind speed from the centre to the border of the eddy downstream and the SST perturbation. SST perturbations range from 1 to 6 _C for a mean eddy SST of 15.9 _C and mean SST perturbation of 2.65 _C. The diameter of the eddies range from 100 to 250 km. Mean background wind speed is about 12ms□1 (mostly southwesterly to northwesterly) and ranging mainly from 4 to 16ms□1. The mean wind increase is about 15 %, which corresponds to 1.8ms□1. A wind speed increase of 4 to 7ms□1 above warm eddies is not uncommon. Cases where the wind did not increase above the eddies or did not decrease downstream had higher wind speeds and occurred during a cold front associated with intense cyclonic low-pressure systems, suggesting certain synoptic conditions need to be met to allow for the development of wind speed

anomalies over warm-core ocean eddies. In many cases, change in wind speed above eddies was masked by a large-scale synoptic wind speed deceleration/ acceleration affecting parts of the eddies.