



Evidence of upwelling near Fraser Island, Australia

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We discuss the relationship between bottom boundary layer current and surface layer wind generated stress as drivers of MODIS observed sporadic high Chlorophyll-a (Chl-a) events along the east coast of Australia near Fraser Island for the period 2002-2012. It appears that frequent events exhibit two characteristic near-coast and mid-shelf distributions. These are referred to as Pattern 1 (P1) and Pattern 2 (P2), respectively. P1 is observed more frequently from about March to July and P2 from about August to December. About 78% (P1) and 75% (P2) of all events occur during these periods. The length of a typical event is estimated with about 7-8 days in both cases. The mid-shelf located P2 event is of particular interest. It appears frequently in the same spatial domain leading to a distinct Chl-a 'hot spot'. It coincides, firstly, with a region previously identified as one of eight eastern Australian key marine ecological sites and secondly, with a 'hot spot' in East Australian Current (EAC) generated bottom stress. The majority of all P2 events (>70%) occur with both upwelling favourable bottom and wind stresses during the August to December period. Bottom stress is at a maximum (although upwelling favourable throughout the year) and more frequent upwelling favourable northerly winds occur during this period. The EAC was previously found to be a driver of surface nutrient enrichment and upwelling processes along the Australian southeast coast. Here, we establish that bottom stress in combination with favourable wind-stress not only drives high chlorophyll during the August to December period. It appears to be also the main cause behind one of the most significant key marine ecological sites along the Australian east coast.