Characterization and Evolution of Marine Heat Waves in the Peruvian Upwelling System

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Rapidly developing extreme events such as anomalously warm water events, known as Marine Heat Waves (MHWs), have received considerable attention in the past few years due to the significant impact they have on regional ecosystems and socioeconomic activity. The Peruvian Coastal Upwelling System (PCUS), one of the most productive ecosystem in the world in terms of fisheries, is highly exposed to climate variability in particular because of its geographic location close to the equator, and the influence of the subtropical high pressure cell variability.

The PCUS is highly influenced by El Niño events, which have been intensively studied, and whose variability is related to the longest and most intense MHWs in the region. However the very visible El Niño events probably overshadowed the MHWs of shorter duration that also have an important impact on the coastal environment as they can often go with other extreme events such as nearshore hypoxia. To date, a census of MHWs of shorter duration (less than 30 days) is lacking in the region.

Here, we investigate the characteristics (spatial variability, frequency, intensity and duration) and evolution of such MHWs in the South Tropical Eastern Pacific, with a focus on the PCUS coastal area where the ecological vulnerability is higher. Several sea surface temperature satellite products are compared to test the sensitivity of the results.

The distinction between El Niño events and regular MHWs has a major impact on the statistical distribution of MHWs properties in the South Equatorial and South Tropical Eastern Pacific as well as on their evolution over the last 35 years. First results indicate that in the equatorial region and along the Peruvian coast, fewer MHWs and of shorter duration are observed north than south of 15°S. The observed trend is an increase of MHWs occurrences, duration and intensity in the South Tropical Eastern Pacific over the last 35 years, with the exception of the coastal region off Peru where the trend in occurrences and duration is the same but the average temperature anomaly associated to MHWs has decreased. It also seems that there is no apparent preferential season for the occurrence of MHWs. A study of the possible drivers is performed in an attempt to disentangle...
the role of the local (wind stress, heat fluxes) and remote (equatorial wave activity) forcing.