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The Effect of Local Wind Along an Eastern Boundary Current on the Local Wave Pattern: The Canary Current Case

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There are two types of waves at the ocean surface. During the generation and growing processes, they are designated as wind sea; as waves propagate away from their generation area, they are called swell. Swell waves travel long distances across the globe with little attenuation For this reason the wave field does not necessarily reflect the local wind field characteristics. Since swell propagates long distances, across entire ocean basins, in the open ocean the wave field is, most of the times, the result of contributions from waves with different frequencies and directions, reflecting different origins and ages.
The qualitative analysis of ocean surface waves has been the focus of several recent studies, from the wave climate to the air-sea interaction community. The reason for this interest lies mostly in the fact that waves have an impact on the lower atmosphere, and that the air-sea coupling is different depending on the wave regime. Waves modulate the exchange of momentum, heat, and mass across the air-sea interface, and this modulation is different and dependent on the prevalence of one type of waves: wind sea or swell.
For fully developed seas the coupling between the ocean-surface and the overlaying atmosphere can be seen as quasi-perfect, in a sense that the momentum transfer and energy dissipation at the ocean surface are in equilibrium. This can only occur in special areas of the Ocean, like marginal or enclosed seas, with limited fetch, or in Open Ocean, in areas with strong and persistent wind speed with little or no variation in direction.
The wind pattern along eastern boundary currents, in the summer, is equator-ward and coast parallel, due to the presence of a semi-permanente high pressure system off-shore, in the ocean, and to a thermal low in-land. The resulting coast parallel winds are the geostrophically adjusted response to this synoptic pattern that drives upwelling along EBC, due to the Eknam transport offshore, sharpening the thermal and pressure gradient at the coast, and increasing the wind speed there. Since this pattern occurs mostly, during summer, the wind pattern also varies, and with it the ocean surface wave pattern.
In this study the wind sea and swell climates along the Canary Current eastern boundary current is presented. The intra annual variation of the coupling of the local wind with the wave pattern, as well as the swell prevalence in the area, is studied in detail.
The study is based on the ERA-Interim wave reanalysis from the European Centre for Medium-Range Weather Forecasts.