THE INFLUENCE OF WIND FORCING ON GRAN CANARIA ISLAND EDDIES GENERATION

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Satellite and field observations indicate that cyclonic and anticyclonic oceanic eddies are sequentially spun off from Gran Canaria Island. Two mechanisms has been proposed for Gran Canaria eddies generation. First mechanism is the perturbation of the mean flow (Canary Current) by the island. Canary Current flows NNE to SSW through the Canaries archipelago with reported geostrophic speeds up to 0.3 m/s (Reynold number, Re, up to 200), and might be expected to give rise to eddies. A second proposed mechanism is eddies generation by wind forcing. Due to trade winds perturbation by the island, strong wind shear lines are generated at the island wake, therefore eddies might be forced by the intense wind stress curl through Ekman pumping mechanism. Preliminary results of a quasi- geostrophic numerical model shows that both mechanisms may operate depending on the relative intensity of the Trade Winds and Canary Current.

For the case of no wind forcing oceanic eddies are generated (oceanic Von-Karman like eddy street) for incident geostrophic speed up to 0.1 m/s (Re up to 60) as consequence of the detachment of the island boundary layer. Wind forcing was introduced by simulating first the atmospheric flow perturbation by the island for various incident wind intensities and then the mean wind stress obtained was used as the atmospheric forcing condition. For an incident wind up 4 m/s (Re>60) an atmospheric Von-Karman like eddy street also develops and the mean wind field leads to a two counter-rotating wind vortex at the leeward side of the island. When this forcing is considered the main effect is the generation of oceanic eddies at a lower intensity of the incident oceanic flow (0.04 m/s, Re=20, for incident wind intensity about 10m/s). However for an oceanic potential flow, where no oceanic boundary layer develops around the island, the vorticity source introduced by the wind is advected downstream and no oceanic eddies are generated. This suggest that the main forcing mechanism is the vorticity source (boundary layer development) generated as consequence of the oceanic flow perturbation by the island. In fact model results shows that oceanic eddies are only directly forced by the wind field in the case of no oceanic incident flow. In this case, as the vorticity introduced by the wind is not be advected by the mean oceanic flow which is zero, two counter-rotating stationary eddies are generated. In summary numerical results suggest that oceanic flow perturbation is a necessary condition for eddy generation but not a sufficient condition. For low current speed and additional atmospheric vorticity source will be required for oceanic eddies generation