WHAT DOES CAUSE THE COLLAPSE OF THE WESTERN ALBORAN GYRE?

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The stability of the Western Alboran Gyre (WAG) is investigated on the basis of the outputs of a state-of-the-art Operational Oceanography System of the Strait of Gibraltar and the Alboran Sea. The system is based on a high-resolution (up to 500 m within Gibraltar) primitive-equation circulation model (MIT General Circulation Model) nested to a larger-scale model of the Mediterranean Sea. It is forced by tides and atmospheric (momentum, heat, and fresh water) fluxes provided by the Spanish meteorological Agency. Satellite and model SST corresponding to a hindcast run of Autumn 2011 show the classical circulation of the Alboran Sea at the beginning of October, characterized by the presence of two well developed anticyclonic gyres with the Atlantic jet flowing north-east at the exit of the strait to surround the WAG. This configuration breaks down within a time-scale of three weeks. In a first stage, the WAG undergoes a noticeable weakening and moves slightly to the east. This, in turn, makes possible the (natural) southward veering of the Atlantic jet and the formation of a new gyre on the African coast. It is shown that the WAG perturbations that triggers the sequence is produced by an event of vortex-vortex interaction between the WAG and a cyclonic gyre generated between the Atlantic Jet and Spanish coast. The development of the cyclonic gyre is explained in terms of the advection of tidally-induced positive shear vorticity generated near the lateral boundaries of the Strait of Gibraltar.