

Sentinel-2A captures high amplitude internal waves in the Strait of Gibraltar

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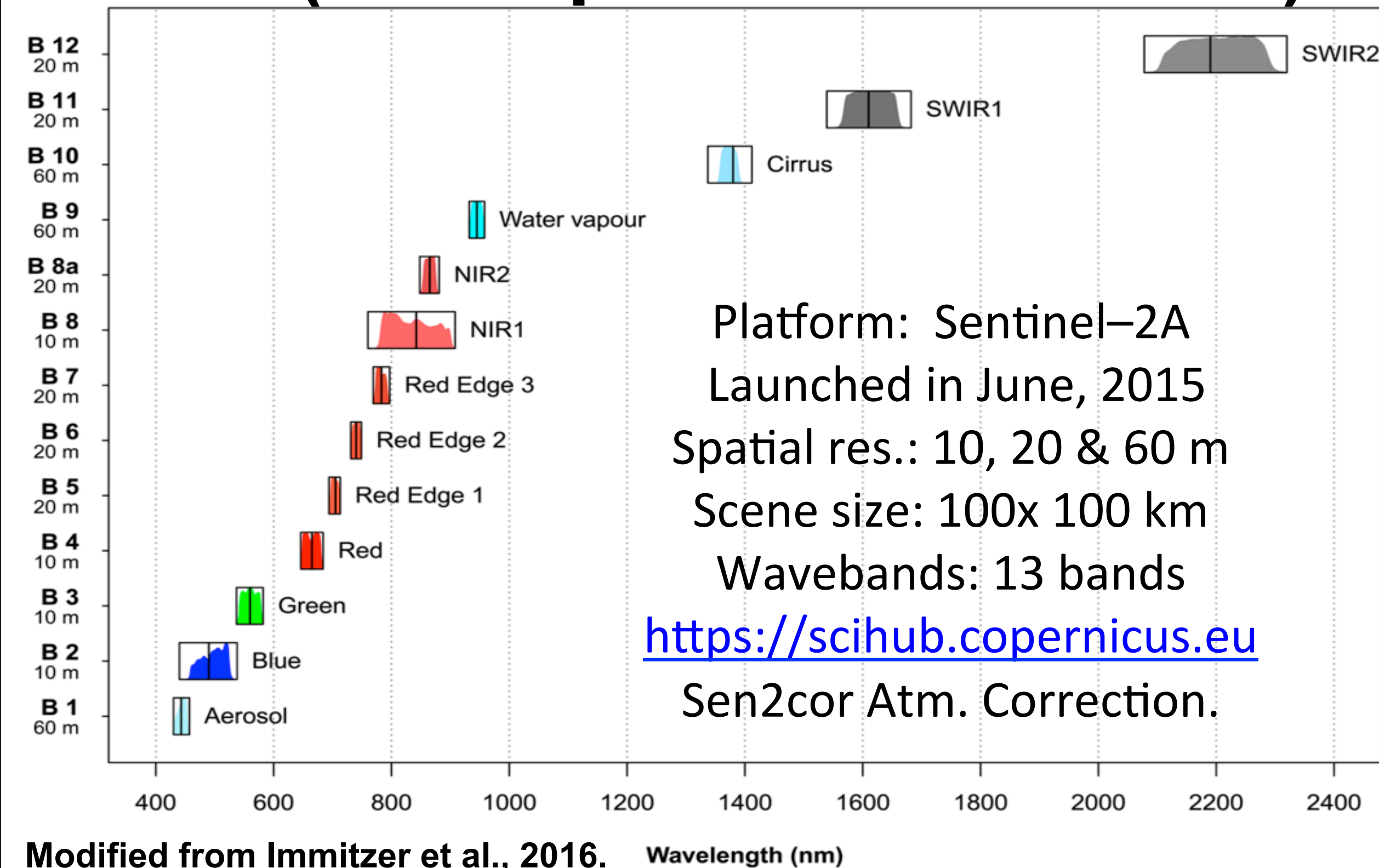
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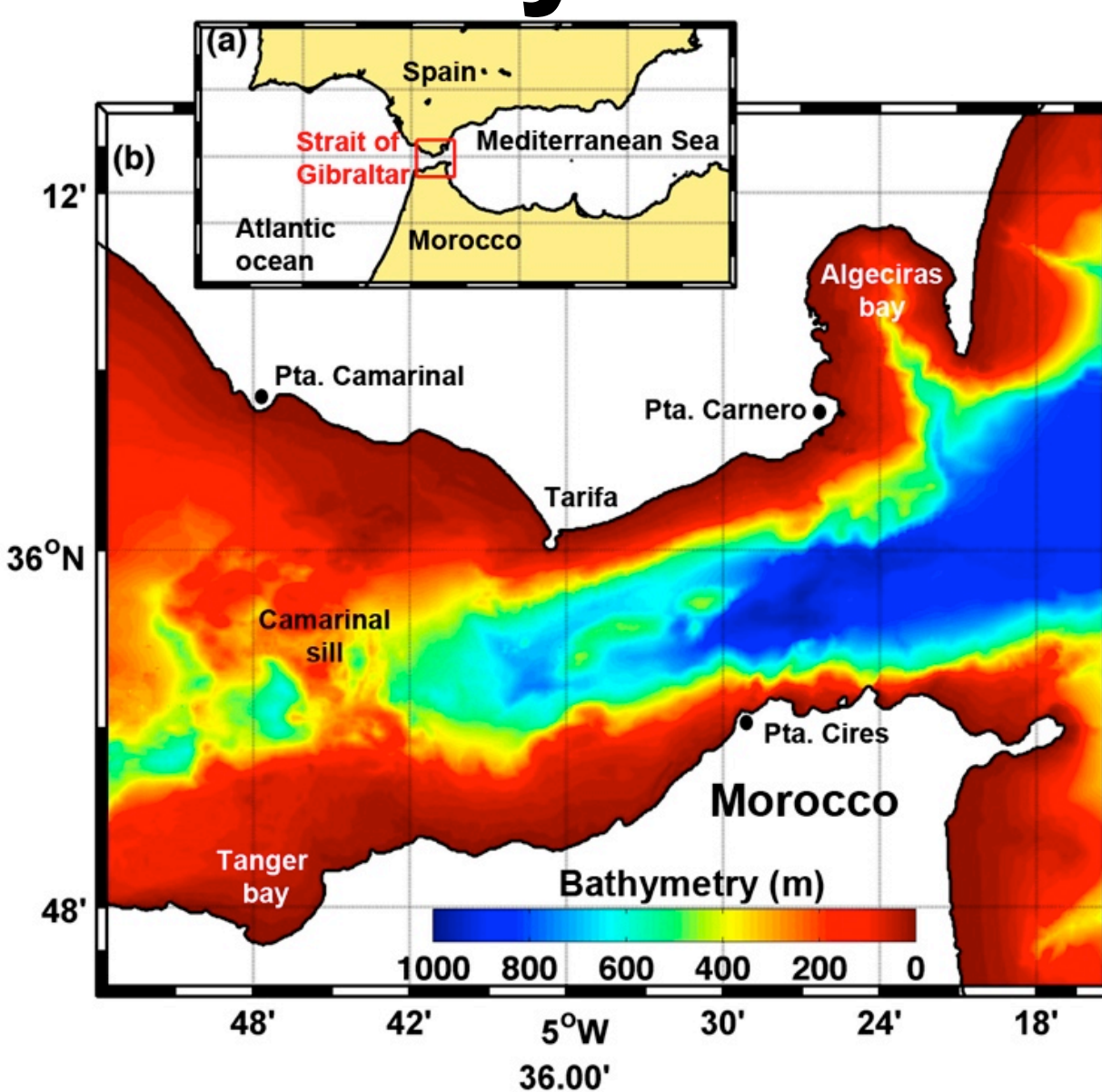
Abstract

Copernicus is the European Programme for the establishment of an European capacity for Earth Observation. The goal of Sentinel satellite constellation (Sentinel 1, 2, 3, 4, 5 and 5P) is to support European operational and policy needs for Copernicus. The Sentinel-2 mission provides continuity to services relying on multi-spectral high spatial resolution optical observations over global terrestrial surfaces. However, here we present two images captured from the Sentinel-2A satellite while several High Amplitude Internal Waves (HAIWs) are presented in both images. These HAIWs are physical processes that normally occur in the Strait of Gibraltar (Southwest of Iberian Peninsula). These internal waves are generated over Camarinal Sill during the tidal outflow (toward the Atlantic Ocean) when critical hydraulic conditions are established. Although presence of HAIWs have been normally observed from remote sensing images such as Synthetic Aperture Radar (SAR), we present two captures (8th March and 7th April of 2016) from MultiSpectral Instrument (MSI) aboard the Sentinel-2A satellite. These events represent one of the first episodes of significant internal waves activity imaged by the new European Space Agency's Sentinel-2A satellite. We performed a L2 processing to estimate biogeochemical properties in the internal waves. In addition, the high spatial resolution of these images (10 m) allows us to analyze the internal wave activity in the Algeiras bay. This study provided the potential of Sentinel-2A images for examining the physical-biological coupling in coastal areas

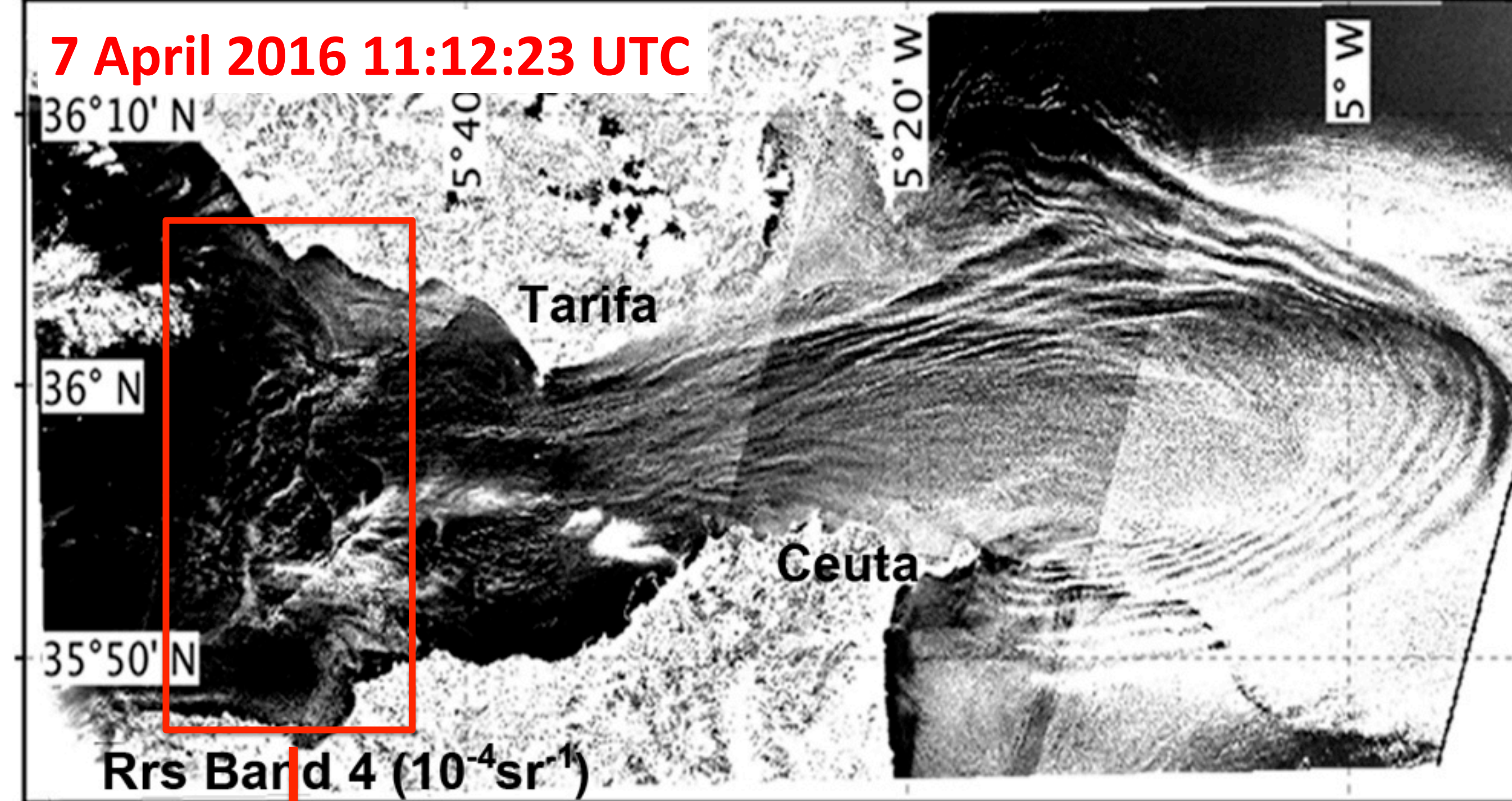
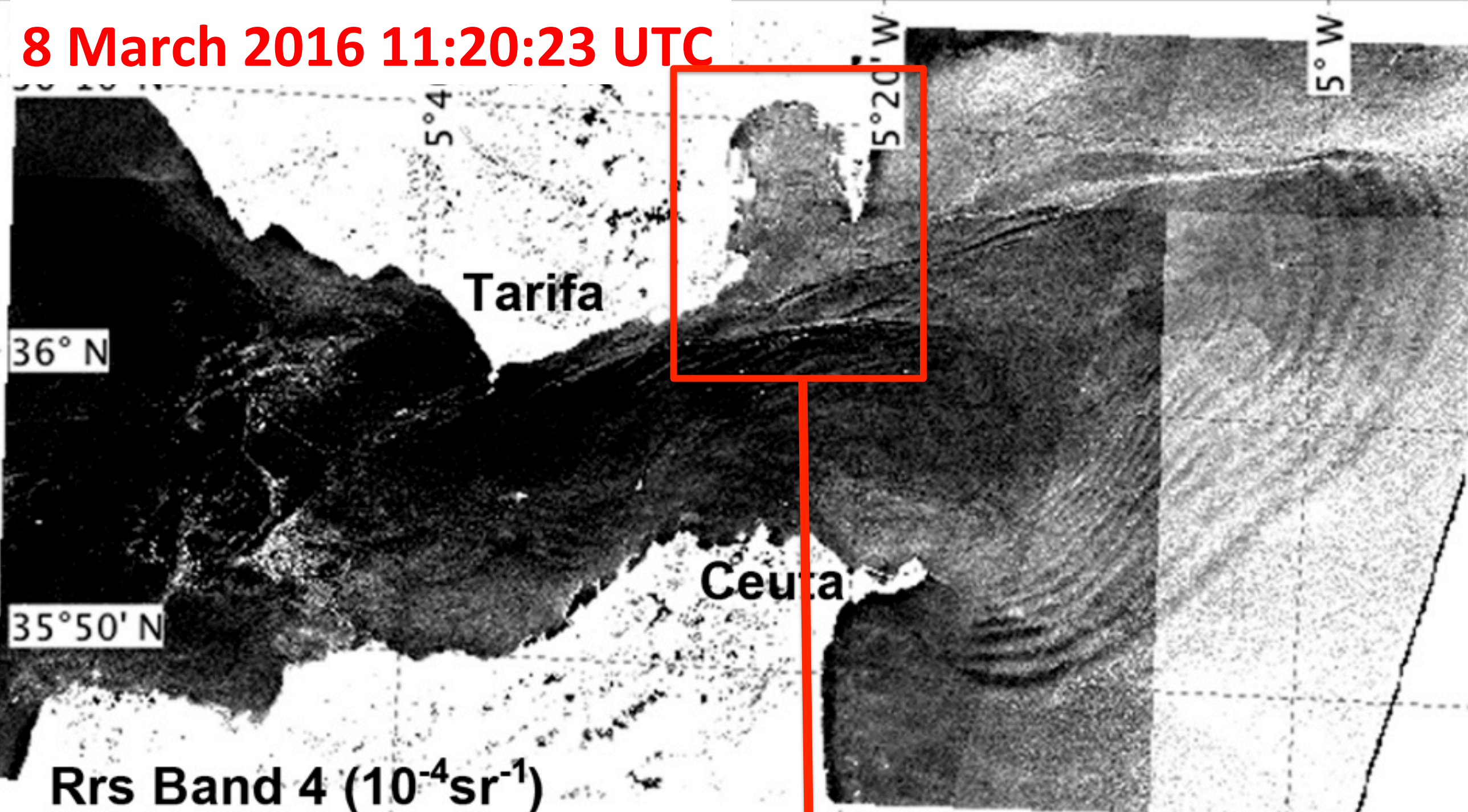
MSI (MultiSpectral Instrument)



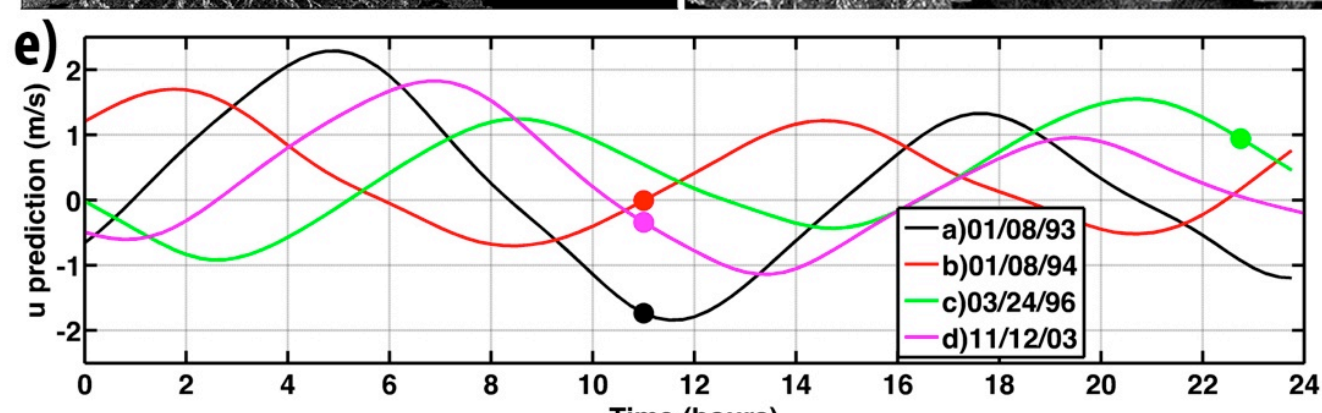
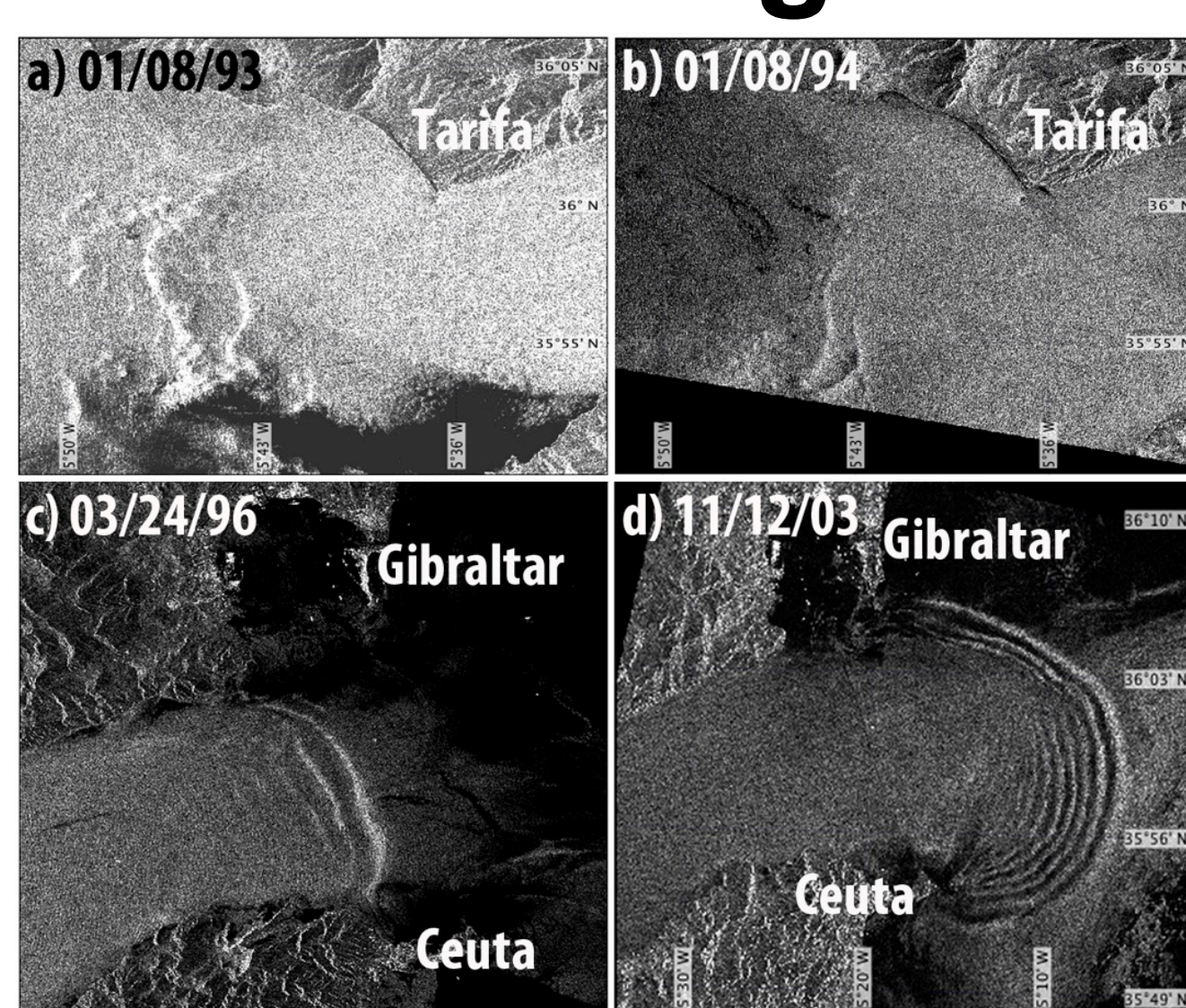
Study area



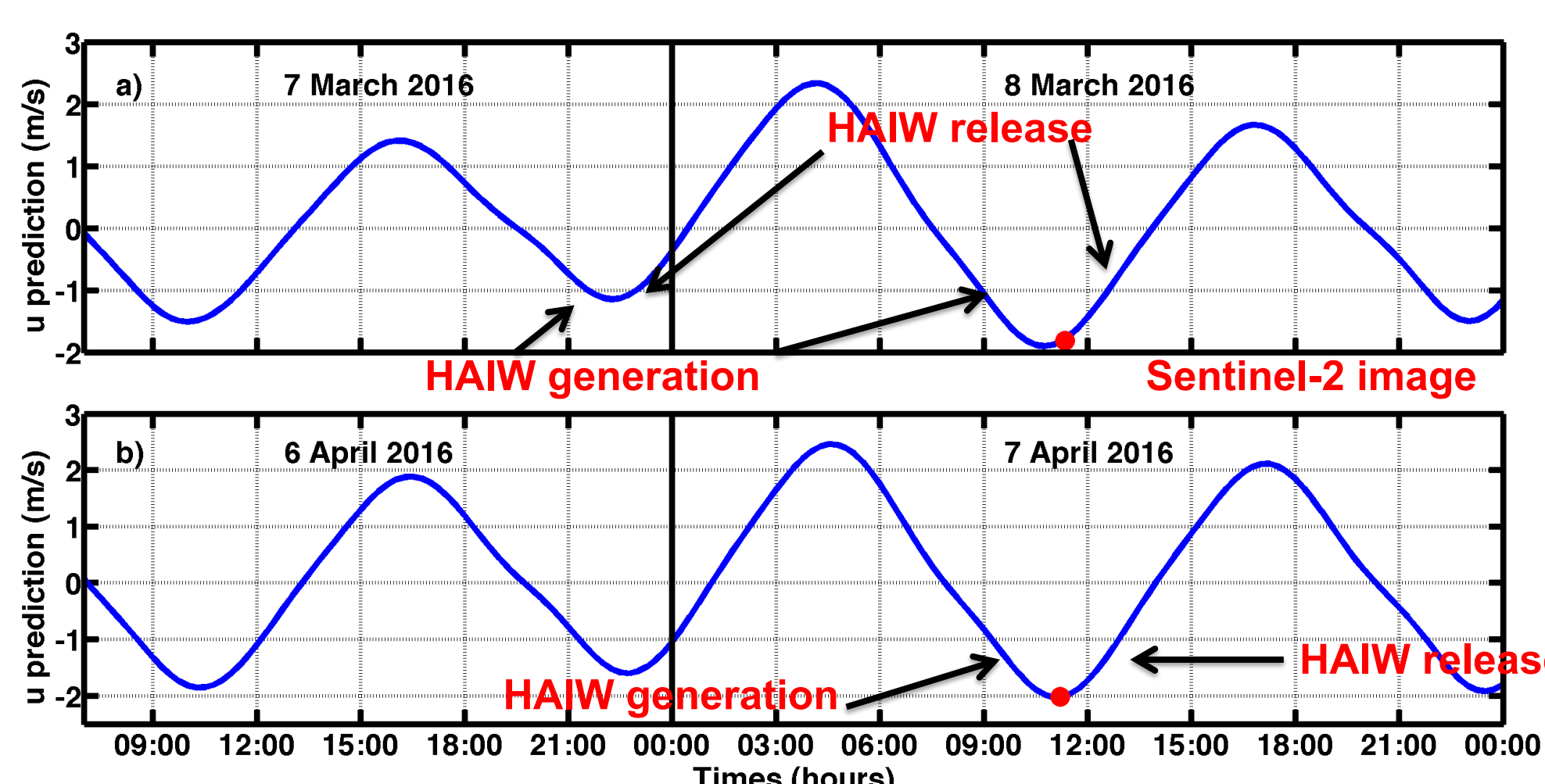
Results



SAR images



Current Prediction



Internal waves came from the refraction of the HAIWs generated in Camarinal Sill while they are travelling toward the Mediterranean Sea. This HAIWs were generated at around 21:00 UTC and liberated about 23 UTC of 7 March 2016. The propagation pathway of the surface signal of these HAIWs changes lightly its orientation to follow the main axis of the Algeiras canyon, as is expected for to the developed of non-linear processes (increasing its amplitude and its energy) during the interaction of the internal waves travelling through a shallower topography.

Internal waves were generated at about 9:00 UTC in the Camarinal Sill. This image shows a curvilinear structure that corresponds to the crest of the internal waves. This form is very persistent in time (see also SAR images). This HAIWs remains "arrested" and growing in intensity and it is trapped by the bathymetry. These HAIWs were released around 13:00 UTC. These surface signatures (HAIWs) in the Strait of Gibraltar are known by the local spanish fishermen and sailors as "hervideros" (boiling water).

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