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Investigating Rhône River plume (Gulf of Lions, France) dynamics using metrics analysis from the MERIS 300m Ocean Color archive (2002 - 2012)

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Abstract

In coastal environments, river plumes are major transport mechanisms for particulate matter, nutriments and pollutants. Ocean colour satellite imagery is a valuable tool to explore river turbid plume characteristics, providing observations at high temporal and spatial resolutions of suspended particulate matter (SPM) concentration over a long time period, covering a wide range of hydro-meteorological conditions. We propose here to use the MERIS-FR (300m) Ocean Colour archive (2002-2012) in order to investigate Rhône River turbid plume patterns generated by the two main forcings acting on the north-eastern part of the Gulf of Lions (France): wind and river freshwater discharge. Results are exposed considering plume metrics (area of extension, south-east-westernmost points, shape, centroid, SPM concentrations) extracted from satellite data using an automated image-processing tool. Rhône River turbid plume SPM concentrations and area of extension are shown to be mainly driven by the river outflow while wind direction acts on its shape and orientation. This paper also presents the region of influence of the Rhône River turbid plume over monthly and annual periods, and highlights its interannual variability.

Keywords: river plume metrics; sediment dynamics; MERIS; ocean color data; suspended particulate matter; Gulf of Lions

1 Introduction

Understanding particulate matter dynamics over continental margins is a challenging issue for environmental purposes as fine particles are vectors of pollutants such as heavy metals or radionuclides. In the North-Eastern (NE) part of the Gulf of Lions (GoL), located in the North-Western (NW) part of the Mediterranean Sea (Fig. 1), the Rhône River is the main source of sediments (Bourrin and Durrieu de Madron, 2006). These particles can be trapped within the