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Formation of thick bottom nepheloid layers in the western Mediterranean basin after major dense shelf water cascading events

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The analysis of a compilation of deep CTD cast conducted in the western Mediterranean from 1998 to 2009 have documented the role that dense shelf water cascading off the Gulf of Lions plays in transporting suspended particulate matter from the coastal regions down to the basin. Deep CTD casts revealed that after the 1999 and 2005-2006 major cascading events, the Western Mediterranean Deep Water was characterized by the presence of a thick bottom nepheloid layer that scaled in thickness with a thermo-haline anomaly generated by the mixture of dense waters formed by deep convection at open sea and by cascading off the Gulf of Lions shelf. Thicknesses of the observed thermo-haline and turbidity anomalies were variable, being up to 650 and 1450 m thick after the1999 and 2005-2006 events, respectively. Concentrations within the bottom nepheloid layers in the central part of the basin were usually around 0.3 mg/l (i.e. 0.1 mg/l above background levels), reaching higher concentrations close to the continental rise, with near-bottom values up to 2 mg/l. These bottom nepheloid layers could be observed to progress from the Gulf of Lions and Catalan margin towards the central part of the northwestern Mediterranean basin, reaching south of the Balearic Islands and west of Sardinia after the 1999 event, and covering the entire basin after the 2005 and 2006 events. Thickness and concentration of the bottom nepheloid layer diminished with distance away from their source and also with time. The turbidity signal could be barely distinguished one year after the 1999 event, but the one generated after the 2005-2006 events can be still clearly detected, confirming that fine particles in deep bottom nepheloid layers can have residence times of several years.