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Larval connectivity studies in the Western Iberian Peninsula

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The study of the connectivity between populations is one of the 'hot' applications of numerical models of the ocean circulation. An IBM (Individual Based model) was developed, using Carcinus manenas larvae crab as a model. A set of particles was used as a representation of larvae, in order to study their larval life cycle, including the larval growth, larval mortality (both depending on temperature and salinity), larval dispersal by currents, diel vertical migration, and larval recruitment. The life cycle of every larvae in the ocean, was modeled from zoeae 1 stage to megalopae stage, during typical periods of 30-50 days.

Larvae were initialized in 14 estuarine systems of the Atlantic Western Iberian Peninsula, from January to July. In every period, a number of 225 larvae are initialized in everyone of the 14 considered estuaries, with fortynighly periodicity. The larvae evolves during the (variable, depending mainly on temperature) period of growth in the ocean, and when a larvae reach the age for recruit, if it is located in the neighborhood of the considered estuarine systems, the larvae is accounted as a recruited larvae in that place. With this methodology, a connectivity matrix can be computed, acconting for the 225 larvae emitted in every estuary, the number of larvae that reaches the every place.

The connectivity matrix depends strongly on the current regime along the Atlantic coast of Iberian Peninsula, and has been calculated for the present circulation, for the period 2001 to 2009, for runs with realistic forcing with NCEP2 and Quikscat (for winds) forcing. The connectivity matrix, have also been calculated for climatological runs.

For the present climatological conditions, it is observed the prevalence of southward transport for the period January-July, because the prevalence of Northerly winds along the west coast of IP in the COADS present time climatology. Strong dispersal is observed at the Northern estuaries, during winter with strong loss of larvae. The most important exchange from January to April exists between estuaries 4 and 5 (Muros and Vigo, Galicia, Spain) with the region of central Porgugal (Figueira da Foz).

During summer, due to the prevalence of strong Northerly winds the mortality for dispersion of the larvae increases, which is reflected by the low values of connectivity observed in the climatological runs.

For the case of realistic circulation for the period 2001 to 2009, the connectivity matrix is strongly linked to the ocean coastal circulation, characterized by predominant poleward/equatorward flow with frequent inversions of the flow, with strong interannual variability, which are accounted in the model configurations. The patters of connectivity respond to the atmospheric variability, and the connectivity is strongly variable. The variability in the connectivity, in terms of mean and its anomalies, will be discussed .