Stochastic analysis with coastal connectivity on larval networks in the Seto Inland Sea

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Connectivity measures stochastic processes of larval dispersal due to chaotic coastal circulations (e.g., Mitarai *et al*., 2009). In the present study, we quantify connectivity using Lagrangian PDFs of enormous amount of Lagrangian particles released in the modeled SIS circulation field in a double-nested, high-resolution configuration based on ROMS at the horizontal grid spacing of 600 m (Uchiyama *et al*., 2012). Lagrangian PDFs are evaluated from the trajectories of many particles released from 170 source patches with a diameter of 5 km until the advection time of 30 days. The release of the particles at each source patch occurs every 12 hours for three-month periods in winter 2011 and summer 2012.

The Lagrangian PDFs and the associated connectivity patterns are heterogeneous. The connectivity matrices successively depict the larval networks in the SIS for winter and summer. We separate the SIS into 8 regions (Bungo Channel, Iyo Nada, Suo Nada, Aki Nada, Hiuchi Nada, Harima Nada, Osaka Bay, and Kii Channel) to determine the connectivity among them. The fraction of the particles that exit to another region is less than 50 % except for both the channels, suggesting that particles mostly remain in the release region. In winter, the particles tend to be advected from Bungo Channel to Kii Channel by following the mean clockwise circulation of the SIS, while this eastward transport is less intensive in summer. The regional connectivity is attributed to the seasonal variations of the mass fluxes at the straights between two neighboring regions. Destination strength shows that particles released from Harima Nada, standing for larvae of marbled sole, are mainly transported towards Akashi Strait and the northern shore of Shodo Island. In turn, the particles released from the nearshore of Hiroshima Bay, standing for larvae of giant Pacific oysters, remain around the origin.

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