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Across the Straits: a review of methods to compute mass and nutrients transports through straits and channels

Lorenzo Pasculli^{1,2}, Francesco Marcello Falcieri², Jacopo Chiggiato², Katrin Schroeder², Jesús García Lafuente³, Simone Sammartino³, Jose Carlos Sánchez-Garrido³, and Angelo Rubino¹

¹Department of Environmental Sciences, Informatics and Statistics, University Ca' Foscari of Venice, Venice, Italy

²Consiglio Nazionale delle Ricerche – Istituto di Scienze Marine (CNR – ISMAR), Arsenale-Tesa 104, Castello 2737/F, 30122 Venezia, Italy

³Physical Oceanography Group, Instituto de Biotecnología Y Desarrollo Azul (IBYDA), University of Málaga, Spain

Ocean straits connect basins characterized by different fluid properties. They are important exchange areas showing peculiar phenomena that often strongly influence physical as well as biogeochemical exchange processes. These are mostly unique for each strait, depending on its specific bathymetry, local air-sea interactions, and remote forcing. Consequently, different methods for observing straits dynamics and fluxes have been developed. Starting from analogue current meters, technological development has led to the use of increasingly complex instruments, such as acoustic as well as microwave devices. Hence, in situ measurements are complemented by remote sensing methods to accurately determine current velocities across the straits. The advent of very high-resolution numerical models, which are able to reproduce small-scale features of the near surface as well as of the interior water masses, yielded a strong improvement in the understanding of straits dynamics. Starting from the 1960s, much work has been devoted at developing an integrated approach to the study of sea straits, including in situ and remote sensing observations, and modelling analysis. In this work, we examine different methods used to observe, monitor and simulate the dynamics of sea straits and their biogeochemical impact, focusing particularly on integrated approaches.