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Hydrodynamics at high frequency around the archipelago of Saint Pierre and Miquelon

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The Saint Pierre and Miquelon (SPM) archipelago is located on the south-western border of the Newfoundland Grand Banks (GB). This region is an area of great ecological and economic interests. However, hydrodynamical conditions remains poorly known.

Bottom temperature observations were conducted two years ago around the archipelago by depths of 30-80m during the stratified period and they underlined strong variations in temperature. It turns out that the main period of these oscillations corresponds to the tidal component O1 (25.95 h) whereas the regional surface tide is dominantly semi diurnal. Despite a diurnal anomaly of the barotropic tidal currents which has already been described propagating around the Grand Bank, these near bottom temperature oscillations (which can reach 10°C) make this area of great interest.

At this latitude (47°N), diurnal oscillations are sub-inertial, does it imply that these oscillations have the characteristics of a coastal trapped wave (CTW) ?

New current and temperature observations have been collected recently in summer 2017, in shallow water (from 10 m to 80 m) from the surface to the bottom around the archipelago. About 30 thermistors moorings have been deployed and they show strong vertical oscillations which can reach 40 m and are enhanced near the bottom at diurnal frequency.

After describing the observations, the main objective is to understand the dynamic processes related to this diurnal oscillation. A 3D model of the area has been implemented It uses a schematic stratification which corresponds to the summer period (from measurements of summer 2017) and tidal forcing. The first simulations are reproducing the barotropic tide. The amplitude of the temperature oscillations are consistent with the measurements. Those results allow us to do a first interpretation of the underlying physical processes.