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Impact of the ocean diurnal variations on the intraseasonal variability of Sea Surface Temperatures in the Atlantic Ocean

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Some recent studies have shown that the ocean diurnal cycle could increase the intraseasonal variability of the Sea Surface Temperatures (SST) in the Tropics (Shinoda and Hendon, 1998; Bernie et al, 2005; Shinoda, 2005). This study aims at extending these analyses to the mid-latitudes. The non linear processes by which the ocean diurnal variations can affect the intraseasonal sea surface temperatures (SST) variability are investigated.

To conduct these analyses, the CNRMOM1D 1-dimensional ocean model is forced with ERA40 reanalysis data with a 1 hour frequency in solar heat flux (6h hours for the other forcing fields). The turbulent vertical mixing scheme (Gaspar et al., 1988) is based on the parameterisation of the second-order turbulent moments expressed as a function of the turbulent kinetic energy. The model has 124 vertical levels with a vertical resolution of 1m near the surface and 500m at the bottom. This high vertical resolution combined with a high temporal forcing resolution allows to simulate a realistic diurnal cycle of the oceanic upper-layers.

This experiment is compared with one forced on a daily time-step. The comparison between both experiments highlights an impact of the ocean diurnal variations on the amplitude of the intraseasonal SST variability in the Tropics and on its timing in the mid-latitudes. In the mid-latitudes, diurnal variations in wind stress and non solar heat flux are shown to affect the daily mean SST. Since such a temperature anomaly associated with the ocean diurnal variations persists for 15 to 40 days in the midlatitudes, the ocean diurnal variations are shown to affect the intraseasonal SST variability.