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Impact of horizontal atmospheric resolution on decadal predictability processes using the IPSL-CM5A model

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Various climate models in the CMIP5 framework are used to assess the decadal predictability of global and regional climate. The models differ among themselves and the physical mechanism working behind their predictions becomes complex to understand using multi-model approaches. Here, in contrast, we quantify the predictability skill in a single climate model: IPSL-CM5A. Two versions of the model, differing by the atmospheric resolution, are initialized by nudging to observed SST anomalies for the 1950-2005 period. We assess the effect of initialization in both systems by comparing the initialized simulations to various ocean reanalyses and evaluate the agreement between reanalysis and nudged simulation, especially in the subsurface ocean, where no initialization is done directly in order to maintain dynamical consistency. As a second step, the performances of hindcasts launched from these initialized simulations are assessed as compared to the initialised simulation (potential predictability) as well as to the observations (effective predictability). The SST in the tropical Atlantic and in the western tropical Pacific is potentially and effectively predictable at lead time 1 year. The hindcasts also display significant potential predictability for averaged lead time of 6-9 years in the tropical Atlantic, North Atlantic and North Pacific regions. The influence of the atmospheric resolution on the predictability skill as well as the associated physical mechanisms are finally analysed.