## Super Resolution Data Assimilation for an operational ocean-sea ice data assimilation system

Super Resolution Data Assimilation (Barthélémy, S., et al. (2022). Super-resolution data assimilation, Ocean Dynamics) aims at reconstructing High Resolution (HR) fields out of a Low Resolution (LR) model outputs, allowing to assimilate High Resolution observations. It thus enables analyses comparable to those obtained in a fully high-dimensional data assimilation system but at a significantly reduced cost (as the computational complexity for running the model increases cubically with the resolution). It consists in training a deep Neural Network (NN) to map the outputs of a low resolution model into high resolution fields, assimilating high resolution observations with the Ensemble Kalman Filter (EnFK) and then going back into the low dimension space to run the LR model for the next forecast step. Here, we apply this strategy to TOPAZ, a coupled ocean/sea-ice/Biogeochemistry data assimilation system for the North Atlantic Ocean and the Arctic, existing in two versions: TOPAZ 2 (12 km resolution) and TOPAZ 5 (6 km resolution), each one with 50 vertical layers for the ocean and BGC variables and 5 categories of ice.

*Antoine Bernigaud (NERSC), Laurent Bertino (NERSC), Julien Brajard (NERSC), Elio Audusse (NERSC)*