title: *From particle methods to hybrid semi-lagrangian schemes*

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Abstract:

In this talk I will present two classes of particle methods with remappings, which aim at improving the accuracy
of existing particle codes.

Both methods use as available data the particle trajectories computed by a reference particle code, and they
compute local linearizations of the characteristic flow. A first approach consists of transporting smooth particle
shapes exactly along the corresponding affine flows, and then describing the transported density as a sum of
linearly-transformed particles (LTP). This method has good convergence properties that can be demonstrated
both at the theoretical and the numerical level.

For long remapping periods the LTP is affected by the fact that extended particle shapes deteriorate the locality
of the method, which leads to increasing both the approximation errors and the cost of evaluating the density.
To avoid this weakness we have designed a second method which uses a backward lagrangian representation
of the density, based on the local linearizations of the flow. The resulting scheme is more local by construction
and also has enhanced convergence properties, also validated by numerical experiments.

This is a joint work with Frédérique Charles, Antoine Le Hyaric and the Selalib group.