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# Validity domains and parametrizations for white-noise and multiscale models in turbulence and wave-turbulence interactions

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# Validity domains and parametrizations for white-noise and multiscale models in turbulence and wave-turbulence interactions

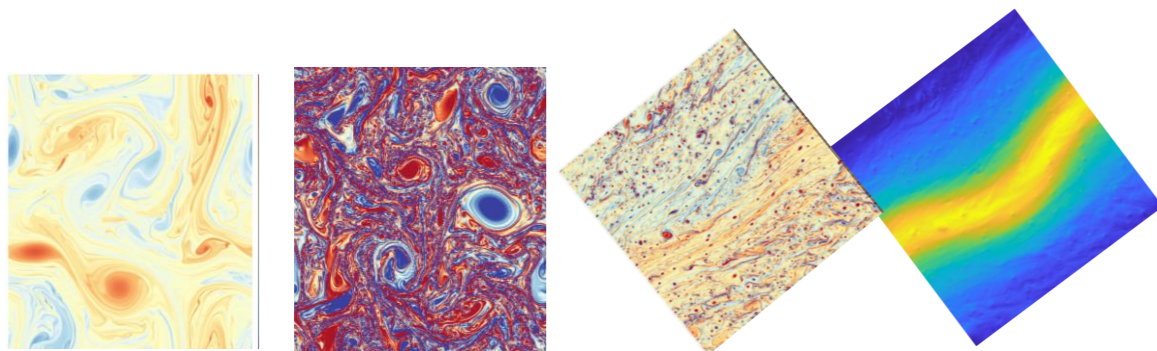
V Resseguier, E Hascoet, B. Chapron, B. Fox-Kemper

**Validity of the time decorrelation assumption for  $v'$**   
for turbulence / wave-turbulence:

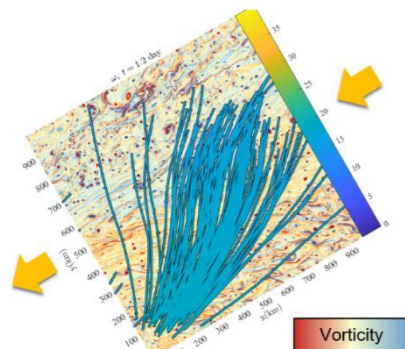
$$\frac{\left( \begin{array}{l} \text{Along-flow/ray} \\ v' \text{ correlation time} \end{array} \right)}{\left( \begin{array}{l} \text{characteristic time of} \\ \text{flow/wave group} \\ \text{properties evolution} \end{array} \right)} = \frac{\left( \frac{l_{v'}}{\|v\|/\|C_g^0\|} \right)}{\left( \frac{1}{\|\nabla v\|} \right)} \ll 1$$

## Applied to

steep-spectrum (SQG) and flat-spectrum (2D Euler) dynamics;  
homogeneous and heterogeneous flows

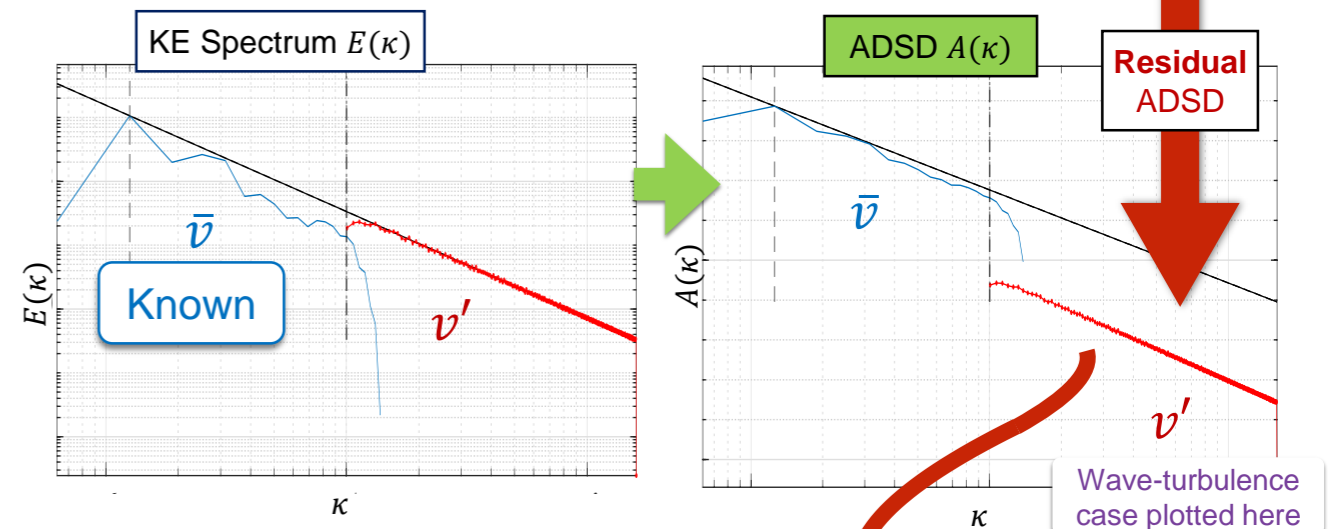
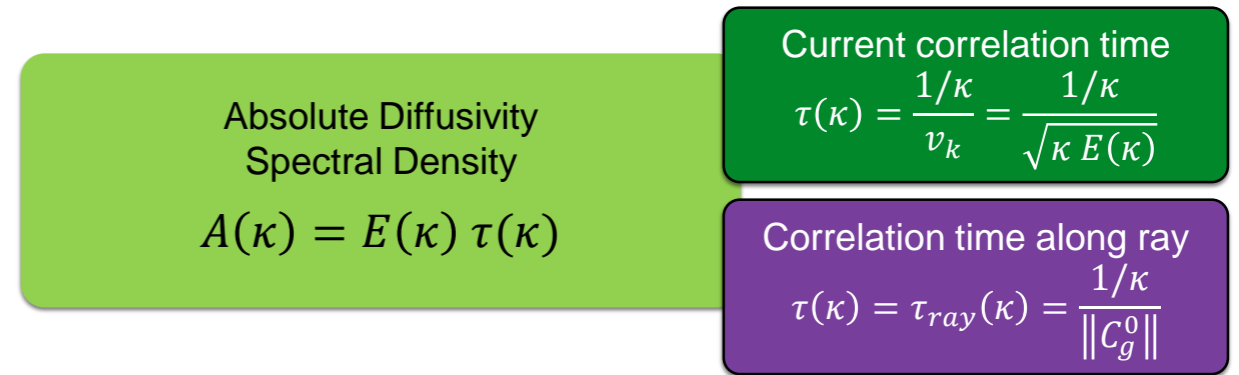


Example of ray tracing



Wave-spectrum,  
Significant wave heights,  
and Currents predictions,  
Uncertainty quantification  
for data assimilation

## Parametrization of white $v'$ for simulations



Reference:  
Resseguier, Pan & Fox-Kemper, NPG, 2020

$$v' = (\text{filter}) * (\text{white noise})$$

**Parametrization of  $v'$  multiscale in space and time are also possible**