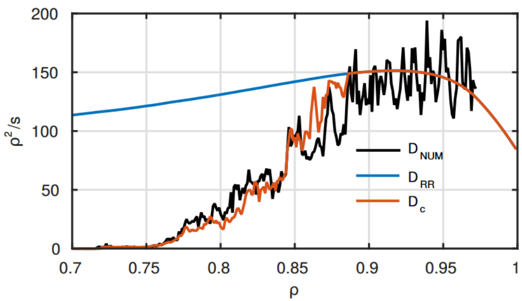
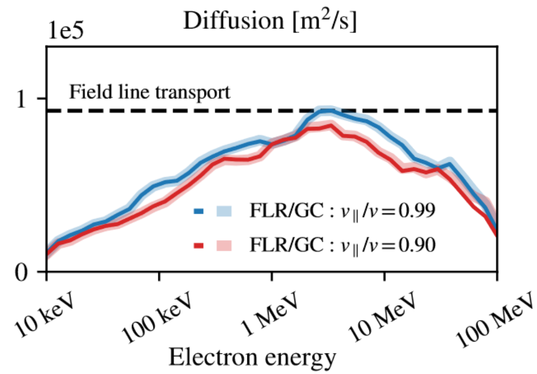
Goal: Calculate transport coefficients for REs in a perturbed field with JOREK

- Rechester-Rosenbluth is a good estimate only if:
  - the field is fully stochastic and uniform.
  - finite orbit width effects can be ignored.





- Transport coefficient calculation implemented to ASCOT5.
  - Implement similar tool to JOREK-particles.
  - Transport model implemented in GO and DREAM.

K. Särkimäki, et al, *An advection–diffusion model for cross-field runaway electron transport in ′perturbed magnetic fields*, PPCF 2016

K. Särkimäki, et al, *Assessing energy dependence of the transport of relativistic electrons in perturbed magnetic fields with orbit-following simulations*, NF 2020

P. Svensson, et al, *Effects of magnetic perturbations and radiation on the runaway avalanche*, J. Plasma Phys. 2020

The general process

- Assume transport is a 1D advective-diffusive process which depends on radius, momentum, and pitch.

- In the transport model, assume no particles are confined.
  - Set coefficients to zero in the confined (core).
  - Remove confined markers in the coefficient calculation?

- Divide 3D phase-space to a grid and trace N (>100) markers at each grid point for 1e-5 - 1e-3 seconds.
  - Markers with fixed radius, momentum, and pitch are launched at the outer mid-plane (OMP).
  - Record radial position each time OMP is crossed.

- The coefficients are calculated in the post-processing at each grid point.

Different ways to calculate the coefficients from the data.

- Caveat: all of these methods assume transport is spatially homogeneous (which is not the case in reality)
- $V = \langle \Delta X \rangle / t$, $D = \langle \Delta X^2 \rangle / 2t$ (can be noisy)
- Fit Gaussian (messy if islands present)
- Fit Inverse-Gaussian to loss time distribution (drift must be positive, no spatial resolution)