



Contribution ID: 89 Contribution code: I.2

Type: **Invited**

## Kinetic and fluid modelling of the SOL

Monday, October 2, 2023 9:00 AM (50 minutes)

### Kinetic and fluid modelling of the SOL

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Plasma transport modelling in the Scrape-Off Layer (SOL) represents one of the most complex numerical studies used in magnetic confinement fusion. These models require interdisciplinary approach to treat plasma, neutral and impurity particle dynamics and their nonlinear interaction with the plasma facing components of the fusion device [1]. Mentioned processes in the SOL influence plasma and power exhaust and hence, define plasma discharge performance and life-time of plasma facing components [2]. At present, the main numerical tools for SOL study represent fluid transport and kinetic codes; although new developments in edge turbulence fluid and gyrokinetic codes brought first impressive results (e.g. see [3, 4]). SOL fluid models are capable to treat realistic magnetic equilibria and wall geometry with relatively lower computing power requirements, but cannot self-consistently treat kinetic effect. The latter are usually provided via simplified full kinetic modelling of the SOL.

In the present work we describe the principles of kinetic and fluid modelling of the SOL and their limitations; discuss a number of long-standing problems, such as multi-dimensional boundary conditions, non-local heat transport, high density plasma edge effects; as well as consider number of new kinetic effects: finite source, kinetic drift and inverse temperature gradients at the wall. We estimate their influence on plasma transport in the SOL and discuss possible ways of their implementation into the fluid and gyro-kinetic SOL transport models.

### References:

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**Session Classification:** Oral session 1 - Scrape-off layer