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- Overview
- NEWS
- Announcements
- Key dates
- Programme
- Timetable
- Invited speakers
- Committees
- Conference venue
- How to reach us
- Social Program
- Fee and payment
- Accommodation and lunches
- Registration
- Guidelines to contributors
- Contribution List**
- Previous EFTCs
- Book of Abstracts
- Journal of Plasma Physics (JPP) Special Issue
- Contact
  - ✉ [eftc2023@igi.cnr.it](mailto:eftc2023@igi.cnr.it)

## Contribution List

94 / 94

89. [Kinetic and fluid modelling of the SOL](#) (1.2)

Dr David Tskhakaya (Institute of Plasma ...)

02/10/2023, 09:00

Invited Oral session 1 - Scrape-...

[Kinetic and fluid modelling of the SOL](#)

D. Tskhakaya1, I. Borodkina1, D. Shvshkin1

100. [SOL impurity transport and effects on H-mode pedestal in closed divertors](#) (1.9)

Prof. Livia Casali (Department of Nucl...)

02/10/2023, 09:50

Invited Oral session 1 - Scrape-...

Impurity seeding studies were performed for the first time in the slot divertor at DIII-D, showing that with suitable use of radiators, full detachment is possible without degradation of core confinement [1]. First ever multi species SOLPS-ITER simulations including full cross-field drifts and neutral-neutral collisions activated in DIII-D demonstrate the importance of

83. [Progress towards the understanding of global effects and negative triangularity improvements with global gyrokinetic simulations](#) (1.6)

Giovanni Di Giannatale

02/10/2023, 11:00

Invited Oral session 2 - Kinetic ...

On the road to fusion energy production, many efforts have been done in order to address the well-known problem of anomalous transport in tokamak devices. Understanding and predicting this phenomenon is a key issue towards the development of future fusion reactors. The

38. [Validation of theoretical upper bounds on local gyrokinetic instabilities](#) (0.1)

Linda Podavini

02/10/2023, 11:40

Oral Oral session 2 - Kinetic ...

Turbulence-driven transport is still one of the main obstacles to overcome in order to obtain feasible thermonuclear reactors. For this reason, the microinstabilities that are found to drive turbulence have been extensively studied in the last decades, both analytically and numerically. In such studies, assumptions about plasma parameters and magnetic

- Overview
- NEWS
- Announcements
- Key dates
- Program
- Timetable
- Invited speakers
- Committees
- Conference venue
- How to reach us
- Social Program
- Fee and payment
- Accommodation and lunches
- Registration
- Guidelines to contributors
- Contribution List
- Previous EFTCs
- Journal of Plasma Physics (JPP) Special Issue
- Contact

### Kinetic and fluid modelling of the SOL

1.2  
2 Oct 2023, 09:00  
50m  
Sala Rossini (Caffè Pedrocchi)

Invited Oral session 1 - Scrape...

#### Speaker

Dr David Takhakaya (Institute of Plasma ...)

#### Description

### 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:

- [1] P.S. Stangeby, "Plasma Boundary of Magnetic Fusion Devices", IOP Publishing, Bristol (2000).
- [2] R.A. Pitts, et al, Nucl. Meter. Energy 20, 100696 (2019)
- [3] A. Corrado and P. Ricci, Nucl. Fusion 62, 036015 (2022)
- [4] D. Michela, et al., Physics of Plasmas 29, 032307 (2022)
- [5] D. Takhakaya, et al., Contrib. Plasma Phys. 48, 89-93 (2008)

#### Primary author

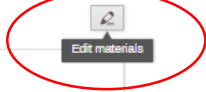
Dr David Takhakaya (Institute of Plasma ...)

#### Co-authors

Dr Irina Borodkina (Institute of Plasma ...)  
Dr Oleg Shyehkin (Institute of Plasma ...)

#### Presentation materials

There are no materials yet.



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