Integrated core-SOL-divertor modelling for ITER including Impurity: effect of tungsten on fusion performance in H-mode and hybrid scenario

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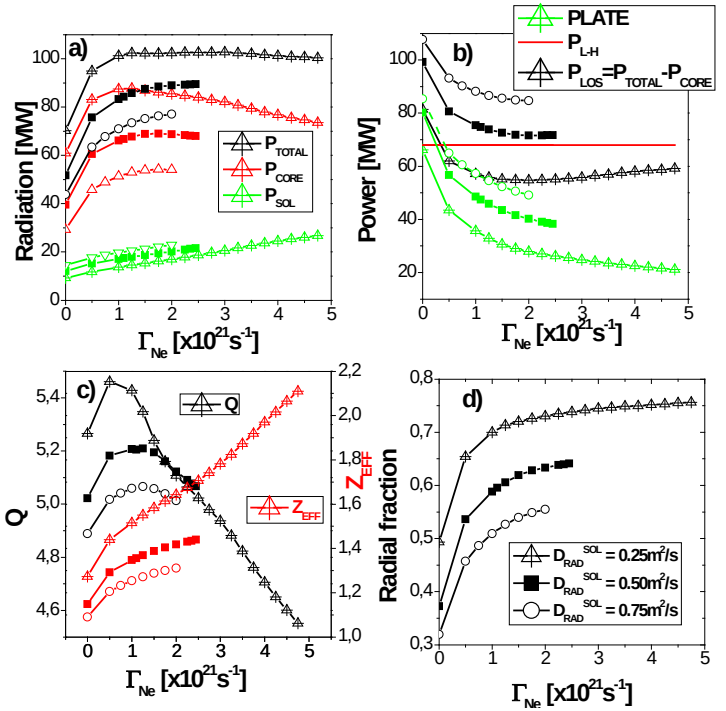
Integrated core-SOL-divertor modelling by

COREDIV + ASTRA/JETTO CODES:

- Development of core H-mode and hybrid scenario with ASTRA and JETTO (GLF23)
- Effect of toroidal rotation in hybrid scenario
- Self-consistent modelling of multi-fluid 1D transport in the core and 2D transport in the SOL
- Divertor plate material - **W**
- Neon gas puff
- Sensitivity studies regarding **W** transport in core and SOL and **W** production in the divertor
  - Effect of **W** pinch
  - Effect of SOL diffusion coefficient
  - Effect of sepatarix density
  - Effect of prompt re-deposition at the divertor



CONCLUSIONS:

- **Impurity pinch:** manifests through the influence of helium on fusion power level and on the ITER operational window (power to the SOL is reduced with increased pinch)
- **Radial diffusion in SOL**: determins screening efficiency of the SOL and is very important for operational window (operation above the L-H power threshold and low power to divertor at D > 0.5 m^2/s)
- **Separatrix density**: very important for controlling tungsten production and screening (operation above the L-H power threshold and low power to divertor only for $n_e^{sep} > 3.0 \times 10^{19} m^{-3}$)
- **Prompt redeposition at the divertor plate**: helps to stay above L-H power threshold, but higher gas puff required to reduce the heat flux in the divertor to acceptable level
- Reduction of fusion gain with Ne puff is compensated by **toroidal rotation shear (ExB shear) stabilisation** in hybrid scenario