Non-linear MHD Simulations of Pellet Triggered ELMs (abstract ID : 186) by S. Futatani et al.

Summary :

- Modelling of pellet ELM triggering of ASDEX Upgrade plasma
  - Critical pellet size for peeling-ballooning mode instability onset
  - A toroidal asymmetry of the power deposition caused by the pellet injection is observed for ASDEX Upgrade plasma, JET, and ITER plasma, in consistent with the DIII-D study [Futatani et al., NF2014].
- Modelling of spontaneous ELM and pellet triggered ELM in JET plasma (Figure 1-3)
  - The density perturbation due to the pellet ablation creates a secondary conection of the particle/heat flux on the divertor target, which creates the double peak of the heat flux profile on the divertor.
- Modelling of pellet ELM triggering of ITER 15MA Q=10 plasma operation scenario (Figure 4)
  - The dependence on the stability limit has been studied. Two equilibrium profiles, one is fully stable which the pressure at the pedestal top is 75kPa, another is the marginal of the stability limit which the pressure at the pedestal top is 112.5kPa. The pellet whose size is 2,0x10^{20}D/pellet triggers an ELM in the plasma of the stability limit. On the other hand, the same pellet size does not trigger an ELM in the stable plasma which has 75kPa of the pressure at the pedestal.

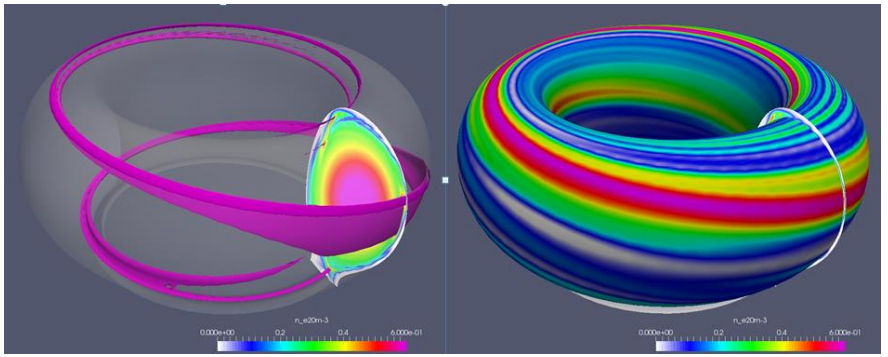

Figure 1: The pellet triggered ELM in JET plasma. (left) The pellet cloud is shown in the pink band. The pellet from outer midplane ablates and the pellet cloud expands along the magnetic field line. (right) The density contour plot on the separatrix. The filamentary structures caused by the pellet are observed.

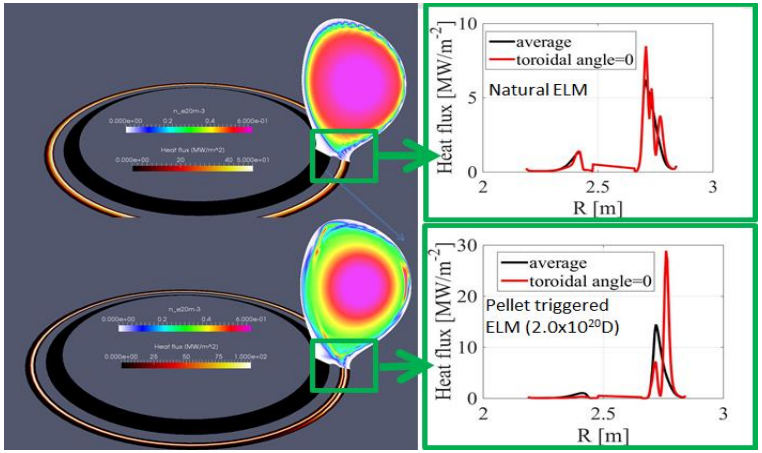

Figure 2: The heat flux on the divertor target during (top) the spontaneous ELM and (bottom) the pellet triggered ELM. The profile of the heat flux caused by the spontaneous ELM is toroidally symmetric.

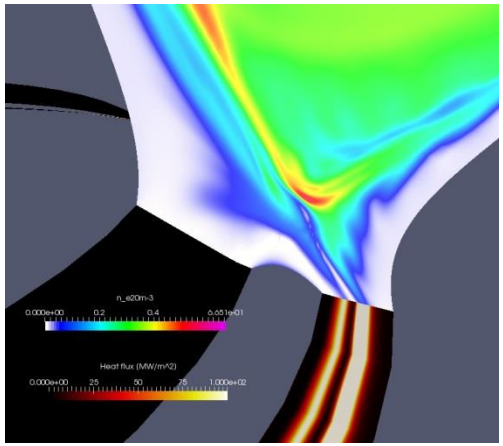

Figure 3 The density contour and the heat flux on the divertor target. The density perturbation due to the pellet ablation creates a secondary connection of the particle/heat flux on the divertor target.

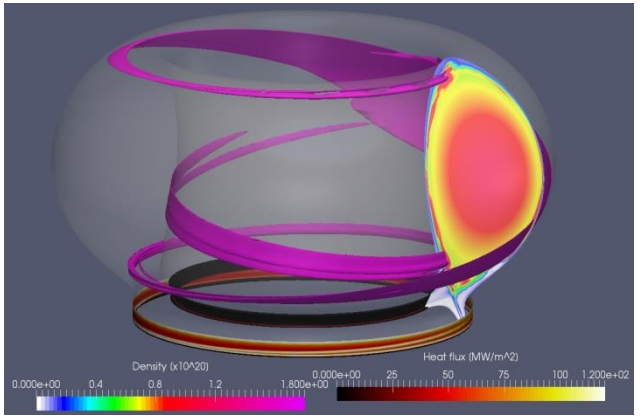

Figure 4: The pellet cloud disribution during the pellet triggered ELM is shown in a pink band. The profile of the heat flux on the outer divertor target by pellet injection of 4.7mm pellet is shown in the color scale on the divertor. The toroidal asymmetry of the power deposition by pellet injection is observed.