



Turbulence and Isotope Effect Session: Summary

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Turbulence simulations in HSX

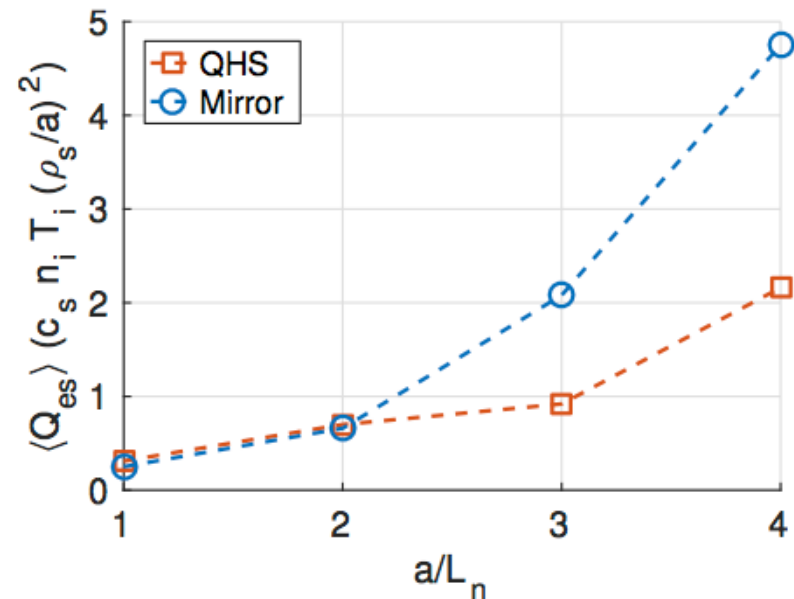
- Complex geometry \rightarrow multitude unstable modes, computationally very expensive
- Quasilinear transport modelling is possible (ITG) provided all the modes are taken into account
- Turbulent transport (TEM) smaller in QHS than in Mirror configuration: targets for **experimental validation**: density fluctuations and zonal flows

Set of diagnostics:

Reflectometer + synthetic diag.

Microwave scatt. and CECE
under construction

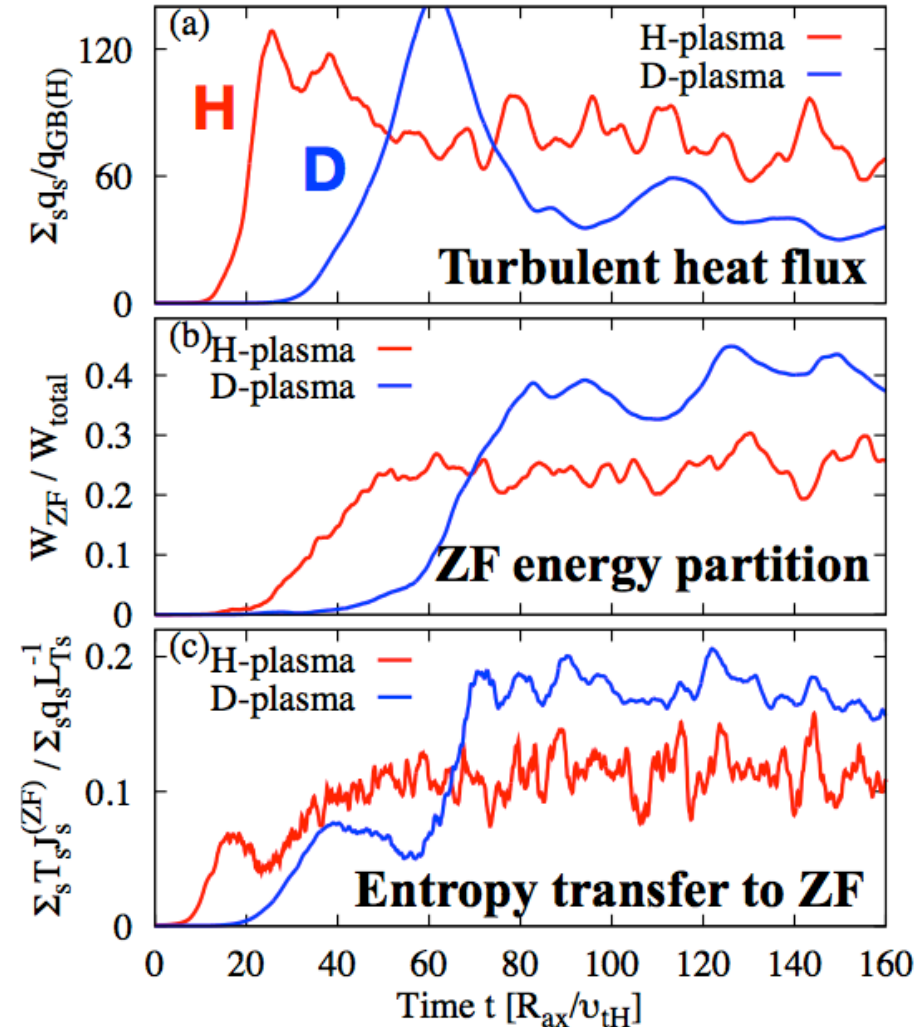
Probes (ZF measurement) and
BES (under consideration) in
collaboration with Heliotron-J
team





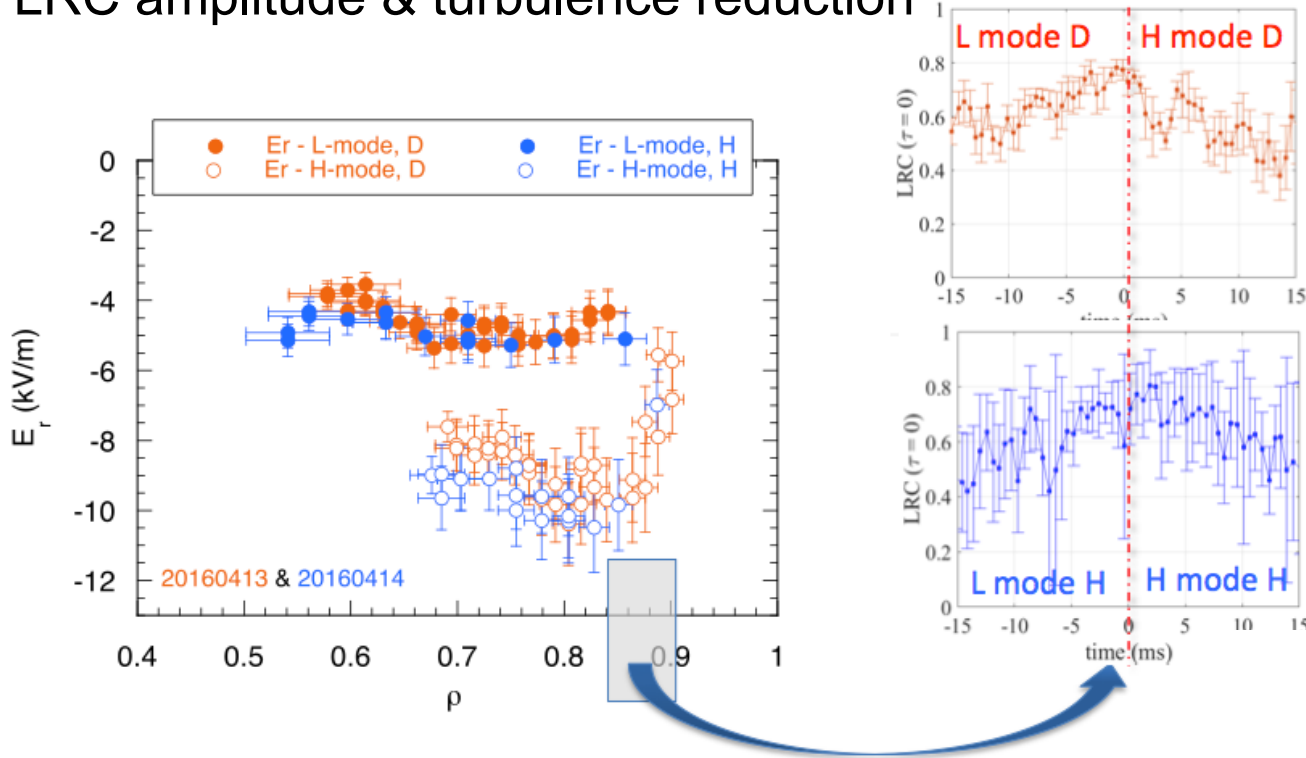
Isotope effects on turbulence and ZF in LHD

- Identification of TEM- and ITG-dominated regimes in exp. conditions
- Inward-shifted configuration: more significant TEM destabilization
- TEM strong isotope dependence in growth rates above certain collisionality
- Transport reduction: linear TEM stabilization + zonal flow enhancement in D plasmas
- ✓ It will be verified in LHD DD experiments





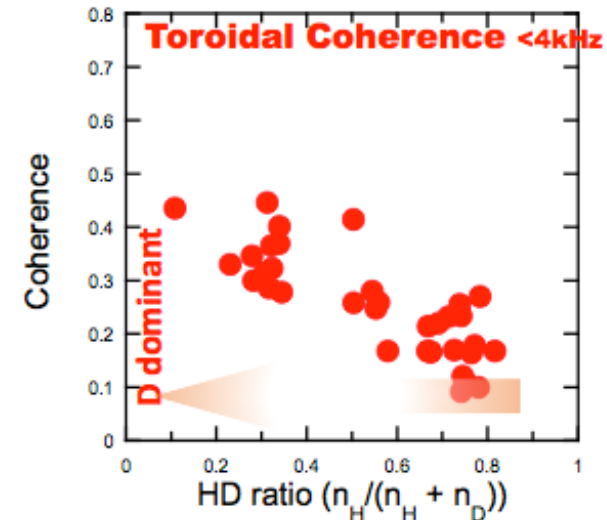
TJ-II: No impact of isotope mass on the L-H transition: similar Er profiles, LRC amplitude & turbulence reduction



Heliotron-J:

LRC increases as D gas becomes dominant

This result depends on the magnetic configuration





Actions to be addressed by GK simulations:

- Understanding of the non-linear saturation mechanisms of turbulence
- Influence of magnetic configuration on ZF development and confinement
- Influence of plasma conditions (TEM vs. ITG dominated plasmas; collisionality) on ZF and isotope effect
- Influence of NC Er on ZF (and ion mass impact on NC Er)

Actions to be addressed experimentally:

- Influence of ion mass and magnetic configuration on confinement
 - **LHD**: validation of GK simulation results: inward- vs. outward-shifted configurations, TEM vs. ITG dominated regimes (Joint experimental proposal for the next LHD campaign submitted and already accepted)
 - **HSX**: validation of GK simulation results: QSH vs. mirror configurations
 - **TJ-II**: explore different configurations (lower ripple)
 - **Heliotron-J**: explore different configurations (bumpiness)
- Role of pressure gradients and ZF at the L-H transition
- Check consistency between isotope effect in L-mode plasmas and in L-H power threshold (ITPA relevant)