Recently, a lot of attentions have been paid to the role of poloidal asymmetries of electrostatic potential (convective cells) in magnetic confined plasmas. Since this kind of structures can be driven by plasma turbulence and they are instrumental in neoclassical transport, consistent modeling of turbulence and neoclassical transport by full-F gyrokinetic code is essential to study this effect. Unfortunately, the conventional electron model used in full-F code filters out the convective cells, we could not have studied their impact on transport. In the present work, we used the newly proposed electron model which can handle the convective cells and compare the results using the previous model. It turned out that the damping rate and frequency of Geodesic acoustic mode are modified due to the filter. In the flux-driven turbulence simulation, it turned out that the convective cells enhance the neoclassical transport but do not have large impacts on profile formation.

### Background: 5D full-F gyrokinetic simulation

- First principle full-f 5D gyrokinetic model is employed for plasma turbulence simulation [1,2]
- Resolving machine scale (~ m) with turbulence mesh (~ cm)
- Solving profile and fluctuation without scale separation (full-F approach)
- Modeling neoclassical and turbulence transport consistently
- Simplified model employed (e.g. adiabatic electron model) compared to local flux tube code due to larger simulation costs
- Introducing kinetic electrons for modeling Trapped Electron Mode (TEM)

### Hybrid electron models in full-F gyrokinetic simulation codes

- Removing convective cells [5]
- Keeping convective cells

#### Model verification: Zonal flow damping and Ambipolar condition

- Same residual level in both model
- Lower damping rate and higher frequency in Lanti's model
- Ambipolar condition satisfied in both models
- Difference in the amplitude can be explained by convective cells
- Particle transport by magnetic drift can be enhanced by convective cells [5,6]

#### Impact of convective cells on transport: neoclassical transport enhanced

- ExB flow shear, ion temperature gradient and total energy flux is almost the same
- Convective cells have few impacts on transport
- The enhanced energy transport by magnetic drift
- Convective cells reduce the energy transport by ExB flow

### Conclusions

- Verifications of hybrid electron models for zonal flow damping and ambipolar condition
- Convective cells enhance the energy transport by magnetic drift