ABSTRACT

- Analysis of ion-neutral momentum exchange explained electric field formations not only for the tokamak boundary but also for the arc discharge and earth ionosphere [1].
- The electron-neutral momentum exchange can play an important role when the plasma is accelerated in an electric field such as ohmic discharge of tokamaks.
- It is found that the strong electric fields of ionosphere such as black aurora and tokamak edge are induced by the ion-neutral momentum exchange.
- Another similarity between black aurora and tokamak edge is that there are circular structures which are occurring periodically with ExB drift.
- The unbalanced momentum exchange between plasma and neutral can generated the intrinsic rotation.
- Intrinsic rotation measurement on KSTAR agreed well with analysis by plasma-neutral interaction.

BACKGROUND: E-Field formation by plasma-neutral collision

E-Field across black aurora

CONCLUSION

1. Plasma-neutral interface with B-field = E-field formation (regardless of scale: arc discharge, tokamak, ionosphere)
2. Two common features of black aurora and ELM
   - strong E-field cross the magnetic field
   - interface breaks into circular structure
3. Intrinsic rotation of fusion plasma is analyzed by plasma-neutral interaction.
   - unbalanced momentum transfer between ion-neutral & electron-neutral
   - ratio of main ion to the impurity ion is key parameter

ACKNOWLEDGEMENTS / REFERENCES

First theoretical analysis quantitatively agrees experiment on intrinsic rotation

This research was supported by R&D Program of *KSTAR Experimental Collaboration and Fusion Plasma Research through the Korea Institute of Fusion Energy (KFE) funded by the Government funds.