

## Future direction of operational ionospheric research

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We are now facing new aspect of operational ionospheric research. International Civil Aviation Organization (ICAO) is planning to revise their protocol and in near future all civil aviation must use space weather information for their operation.

Space weather information is important for aviation mainly in the following three factors; HF communication, aviation and radiation. Space weather phenomena in polar region are tend to be focused on in many cases, however, it is important also in equatorial region, e.g., equatorial plasma bubbles.

There are still some unknown process in space weather and they make the forecast difficult and low precision. We are required two different approach; understand the unknown process, and make empirical forecast methods which works even though we have still unknown process. Especially we need domestic/international cooperation in the former approach e.g., EISCAT-3D and Equatorial MU radar, because it is impossible to cover these observation in only one institute. ICAO issue is one of the important outcome for space weather and we should unify our activity to contribute the operation.

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