

## The relationship between the O<sup>+</sup> density in the plasma sheet and occurrence of substorms

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In order to discuss the role of O<sup>+</sup> ions in triggering substorms, we have examined the correlation between the substorm onset location and the distribution of the number density ratio of O<sup>+</sup>/H<sup>+</sup> in the plasma sheet using ion flux data of the Geotail/EPIC instrument and the IMAGE/FUV substorm onset list (Frey et al., JGR, 2004). The results are summarized as follows:

1) Substorm onsets, viz. auroral brightenings, are likely to occur in the dusk (dawn) side when the ion number density ratio of O<sup>+</sup>/H<sup>+</sup> is high in the dusk (dawn) side.

2) The abovementioned property is predominantly observed in the near-Earth plasma sheet (especially at X = -8 to -14R<sub>E</sub>).

Can we conclude from these results that substorms are likely to occur when the average number density ratio of O<sup>+</sup>/H<sup>+</sup> is high? To answer this question, we next examine the average O<sup>+</sup>/H<sup>+</sup> ratio in the near-Earth plasma sheet when substorms did/did not occur and compare the results. It is found that there are no clear difference in the O<sup>+</sup>/H<sup>+</sup> ratio between the substorm onsets and the non-substorm events, which implies that the occurrence rate of substorms do not change even if the O<sup>+</sup>/H<sup>+</sup> ratio is high.

The above-mentioned results suggest that the O<sup>+</sup> ions in the near-Earth plasma sheet do not increase the occurrence of substorms but simply control the onset location of substorms.

We also discuss the correlation between auroral brightness and the O<sup>+</sup>/H<sup>+</sup> ratio.