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Oxygen Injection Events observed by Freja Satellite

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Magnetospheric heavy ion injections into the ionosphere have rarely been discussed although they were already detected in the early 1970's. We surveyed this at 1700 km height using the Swedish-German Freja satellite data. Heavy ion injections from the inner magnetosphere are mostly found in the nightside sector with a few exceptions that occur on the dayside. Some of them seem to have a different generation/transport mechanism of heavy ions from the majority of cases.

We further investigated two of these exceptional cases: (1) mono-energetic heavy ion injection near local noon with oxygen first and protons later; and (2) a multiple heavy ion dispersion event at 9 MLT. Both events are found during the main phase of major magnetic storms. The first event is probably of dayside origin but the exact mechanism to make both energy filter and mass filter is unknown. The second event can be traced back to one localized energization of dense oxygen with strong pitch-angle anisotropy within 1000 km distance from the spacecraft.