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3D reconstruction and modelling of N_2^+ and OI auroral emissions using the Auroral Large Imaging System (ALIS)

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In 2008 and 2009, coordinated campaigns between the European Incoherent Scatter Radar (EISCAT) and the Auroral Large Imaging System (ALIS) situated in Northern Scandinavia took place to study discrete auroral arcs.

With ALIS the N_2^+ (4278Å) band, the oxygen lines OI (5577Å) and OI (6300Å) can be observed and their profiles can be reconstructed in 3D by means of tomography-like reconstruction techniques. Inversions of the 3D reconstructed volume emission rate of N_2^+ and of the electron densities measured by EISCAT yield energy spectra of the precipitating auroral electrons that can be used as input into transport kinetic/fluid models such as TRANS4.

Both inversions give matching results with a typical average precipitation energy of a few keV. The spatial and temporal extent of the auroral arcs is assessed using average arc width in different wavelengths and the distribution of the characteristic electron energy as parameters.

Comparisons between model and observations are presented for emission brightnesses and electron densities, with predictions on the ion composition, ion chemistry and backscattered fluxes.