

# Incoherent scatter radar estimation of F region ionospheric composition during frictional heating events

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A method is developed for estimating F region ion composition from incoherent scatter radar (ISR) measurements during times of frictional ion heating. The technique addresses ion temperature-mass ambiguities in the IS spectra by self-consistently modeling ion temperature profiles, including the effects of ion temperature anisotropies and altitude-independent neutral winds. The modeled temperature profiles are used in a minimization procedure to estimate ion composition consistent with the recorded IS spectra. The proposed method is applicable to short-integration (<5 min) data sets from either single-beam or multiple-beam experiments. Application of the technique to Sondrestrom ISR measurements shows increases in F region molecular ions in response to frictional heating, a result consistent with previous theoretical and observational work. Estimates of ion composition are shown to be relatively insensitive to moderate variations in the neutral atmospheric model, which serves as input t