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Multi-spacecraft Observation of Electrostatic Solitary Waves in the Reconnection Separatrix Region

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Electrostatic solitary waves (ESWs) are often observed in a vicinity of reconnection regions in association with streaming electron distribution. Such ESWs can be generated by the bump-on-tail, electron two-stream or Buneman instabilities, and lead to transfer of the energy initially contained in electron streaming to heating and acceleration of electrons and ions. Accurate knowledge of ESW potentials and scales is needed to quantitatively address the interaction between ESWs and particles. We present Magnetospheric Multiscale (MMS) observations of ESWs at small inter-spacecraft separation, which allows the same ESW to be observed by all four spacecraft. This provides a substantially longer baseline for interferometry compared to typical $\sim$100 m and shorter when using double-probe measurements on a single spacecraft, which provides a much more accurate estimate of the phase speed, potential and spatial scales of ESWs.