

## Upwelling backscatter plumes in growth phase of equatorial spread F observed with the Equatorial Atmosphere Radar

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Upwelling radar backscatter plumes around sunset time associated with equatorial spread F (ESF) are observationally investigated with rapid beam-scanning capability of the Equatorial Atmosphere Radar (EAR) in West Sumatra, Indonesia (0.20S, 100.32E; dip latitude 10.1S). Nonlinear evolution of plumes which could not be understood by slit-camera-like radar observations was observationally studied with the EAR for the first time. The rising velocity of the observed plumes ranging from a few tens to a few hundreds of meter per second is similar to nonlinear evolution of plasma bubbles simulated by the previous numerical studies. Importance of sunset terminator transition should be considered because of its comparable rising velocity. Since the observed rising velocity is highly variable, many factors should contribute to growth of plasma bubbles.