

Study of Equatorial Atmosphere with the Equatorial Atmosphere Radar (EAR) under the CPEA project

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The Coupling Processes in the Equatorial Atmosphere (CPEA) is a six-year (2001-2007) research project of Japan to study dynamical and electrodynamical coupling processes in the equatorial atmosphere. CPEA seeks pioneer research by means of (primarily) ground-based observations in the Indonesian equatorial region. The main facility for CPEA is the Equatorial Atmosphere Radar (EAR) located right at the equator in West Sumatra, Indonesia. We continue continuous observations with the EAR since June 2001, and have studied atmospheric waves and structures in the troposphere/lower-stratosphere and in the ionosphere/thermosphere. We review results based on observations with the EAR and other instruments developed during CPEA. Some of our research topics are shown below.

- Propagation and breaking of Kelvin waves are studied in the troposphere and lower-stratosphere. Gravity-wave generation from the tropospheric convection is detected with the EAR, radiosondes, and weather radars.
- Vertical motion and laminar structure of the atmosphere is studied, by the vertical-wind mode observations and the frequency domain radar interferometric imaging (FII) techniques with the EAR. In October-November 2005, we conducted an observation campaign for cirrus with a 95-GHz cloud radar, radiosondes and a lidar.
- The equatorial spread F (ESF) is measured as 3-m scale irregularity echoes with the EAR. Pulse-to-pulse beam steerability of the EAR helped much to reveal spatial structures and time evolution of the ESFs. Collocated airglow imager, GPS receiver, VHF radar, and ionosonde are helpful tool for the studies.
- E -region irregularities are a new target of observations. In association with the ionosondes, we can study relationship with the irregularity and the sporadic- E layer, which leads to clarify electrodynamical coupling between the E - and F -region in the equatorial / low-latitude ionosphere.