The Tropical Cyclone Structure (TCS-08) field program provided the first high altitude (300 MB) deployment of dropsondes and AXBTs into pre-genesis, incipient tropical cyclone (TC) systems within the western North Pacific basin. The unique sampling strategy enabled a unique view of the three dimensional (3-D) atmospheric (winds, temperature and moisture) and oceanic thermal environments of ther tropical circulation systems. Data sets from two non-developing tropical systems were inter-compared with one developer (Typhoon Nuri) through the use of the WC-130J data sets, which include Stepped Frequency Microwave Radiometer (SFMR) and airborne radar, MTSAT-derived automated cloud motion winds, NRL P-3 Eldora 3-D winds, and satellite-derived ocean surface wind vectors (QuikSCAT, ASCAT, and WindSat). Aircraft flights were designed to overlap with satellite over-pass times as close as possible. In addition, satellite-derived total precipitable water (TPW), a measure of low/mid-level moisture content which permits mesoscale and synoptic scale features to be resolved, was utilized to observe the relationship of dry- and moist-air entrainment to vortex development. This combination of sensors allowed the aircraft-derived observations to validate satellite-derived observations of ocean surface and mid-level winds as well as sea surface temperature (SST) and subsurface ocean heat content (OHC).

During August, TCS-08 candidate systems included many weak convective clusters as the western Pacific basin experienced an unusual ‘TC drought’ and an anomalous circulation pattern. Organized convective activity was suppressed and the monsoon trough was absent as low-level easterly flow predominated. Several wave-like systems entered the TCS-08 Guam domain from the east and were investigated by the WC-130J and NRL P-3.

Passive microwave imagers were able to augment the TCS-08 aircraft data sets by mapping the rainfall and convective cloud cluster patterns during many daily overpasses. The combination of both operational and research microwave satellite sensors (SSM/I, SSMIS, TMI, AMSR-E, and WindSat) provided frequent temporal observations of convective system evolution that highlights the present ‘Golden Era’ of microwave satellite observations. The fine temporal sampling from the microwave imagers provided
large-scale context in mapping convective organization of the three tropical systems using WC-130J recorded radar video and NRL P3 Eldora Doppler radar data.

Preliminary analysis of the WC-130J dropsondes and AXBTs indicate that the three systems developed within the oceanic ‘Southern Eddy Zone’ between 16-24 degrees N, and that each featured a low-level, near-surface and mid-level vortex couplet with centers offset by as much as 150 km. The low-level circulation was centered in the clear on the western edge of the convective cluster, while the mid-level vortex was embedded within the convective complex. These features suggest an initial de-coupling of the low and mid-levels for the non-developers, possibly due to significant wind shear suggested by the satellite-derived cloud motions.

Both WC-130J and NRL P-3 radar data were collocated within the satellite microwave images of convective clusters, and with enhanced detail and resolution, illustrated the formation of mesoscale vortices imbedded within the satellite microwave convective cores. Underlying ocean features, while approximately the same scale as the mesoscale convective circulations appeared not to play a role in development at this early stage.