PISTON 2019 Daily Science Summary

8 September Daily Summary: Nighttime MCS

PISTON 2, R/V Sally Ride

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We remained at 126 W, 17 N today, and for the most part, it was similar to the past few days. The large scale remains unchanged, with the ops region sandwiched between active areas of convection to our north and west (associated with 95L). A look at water vapor imagery (Fig 1) reveals that although precipitation has been very limited, the area is not “dry” per say (no brown/red colors). The hazy and at times almost overcast skies back this up. Soundings are beginning to show a more coherent wind signal in the low-mid levels, with consistent (albeit weak) westerlies now present from the surface to 500 mb (Fig 2.). This can also be seen in time-height plots of sounding data (which are now being generated automatically) (Fig 3). Perhaps this is a sign of a more active monsoon period beginning – this also agrees with the BSISO progressing further into Phase 6, which is forecast by the GFS and ECMWF (Fig. 4).

After the isolated cell impacted the ship just before the 00Z hour, SEAPOL’s view cleared up again, with the exception of a few shallow warm rain cells. An attempt was made to capture the life cycles of these cells with RHIs, however the motion of these cells were more or less tangential to the radar’s beams, so keeping up with them was difficult. The exception was a cell whose decay was captured well from 11:47 – 12:26 as it moved radially away from the radar.

As night rolled in a cluster of storms came into view on the NW edge of SEAPOL’s range (Fig. 5). Lightning was reported from this direction by an OSU student operating the Chameleon. At the same time, a RHI scan to the east revealed a large anvil extending westward toward the ship (Fig. 6). A surveillance scan was then performed to reveal an large complex of thunderstorms which was almost comically avoiding the ship, wrapping

around the entire north and west of the radar, a few 10s of kilometers out of range of the rain mapping scan (Fig. 7).

The line on the northern side of this complex slowly began to creep more into the SEAPOL's view. However, the ship then made a turn to the right, leaving most of the line in the blanking sector (Fig. 8). RHI's were run regularly on the part of the northern line which was in range. However, the non-radial motion of embedded cells combined with the limited portion of the line which was not in the blanking sector made tracking the evolution of any individual cell unfeasible. Satellite imagery from around this time show a large, mature MCC ongoing over the ops region (Fig. 9).

As the night went on, the MCS every so slowly creeped closer to the ship. Some fantastic RHI's were obtained (Fig. 10), with storm tops up to 18km observed. Unfortunately, for a large chunk of the time, the ship was facing south so that a large portion of the MCS was obscured by the blanking sector. The ship made a turn around 1900, finally bringing the main line into full view (Fig. 11) and revealing a complex structure of embedded cells on the main front traversing eastward, perpendicular to the overall southward MCS motion. The convective line then passed across the ship, with bouts of heavy rain and a 3C decrease in temperature (the wind never actually gusted very high at the ship). The radar's view was then mostly stratiform rain, which was remarkably stratified (for lack of a better word) (Fig. 10).

Overall, a this was a remarkably long-lived and organized system. SEAPOL was scanning this storm in one way or another for over 9 hours, however for much of this time the main convective line was sadly aft of the ship, in the blanked sector. Still, some fantastic RHIs were obtained with lots of interesting details to pick over – it will take some time to go through them all in detail.

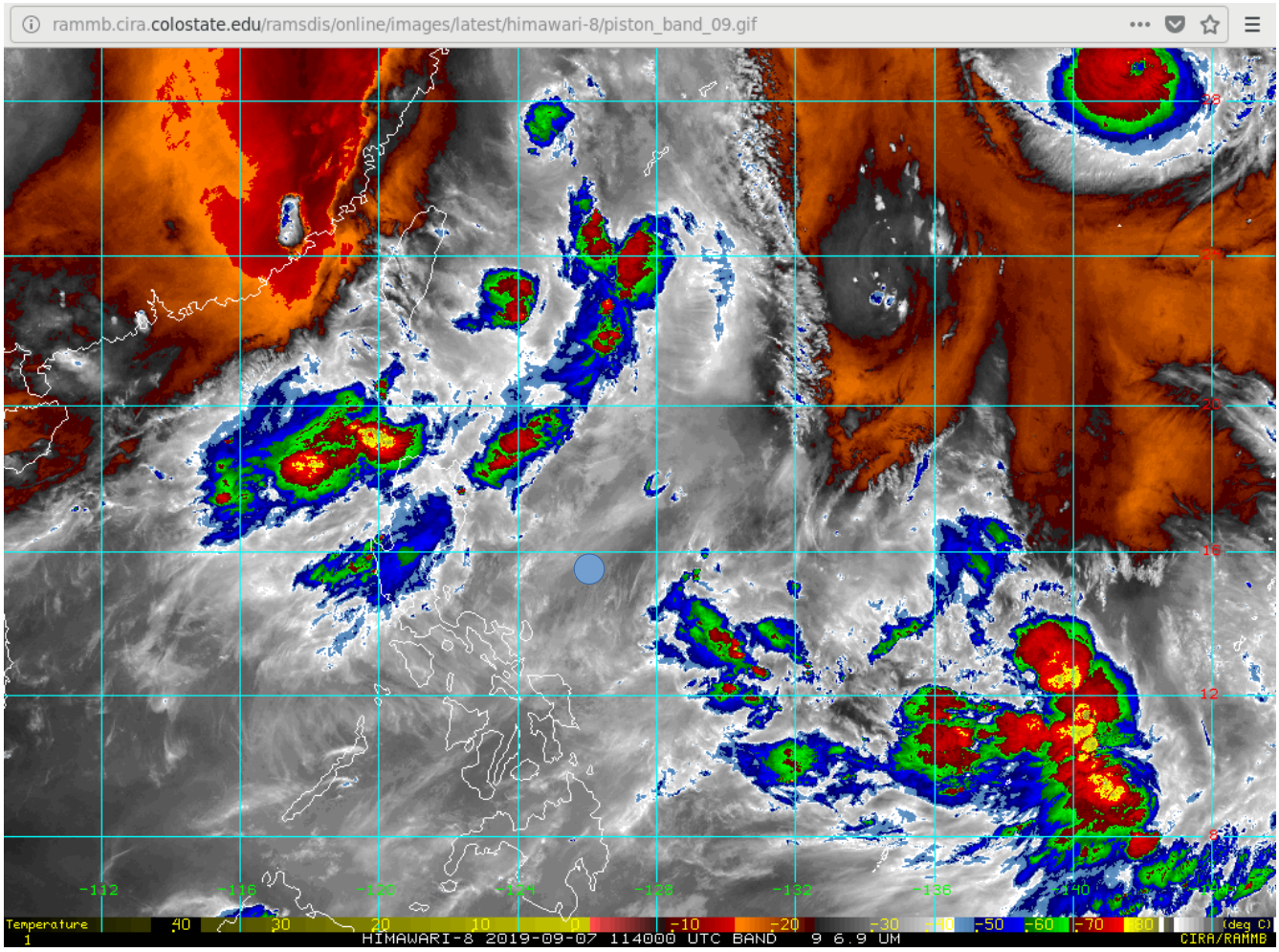
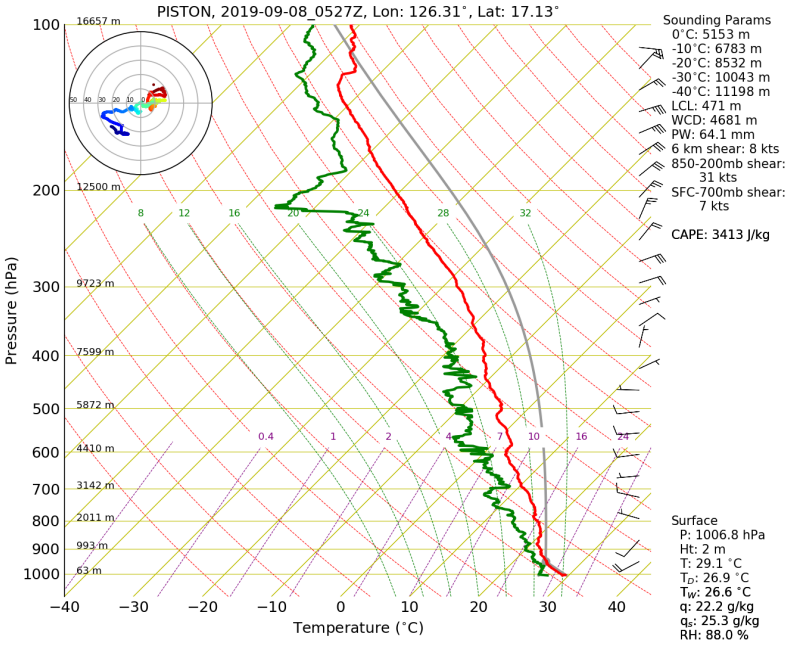


Fig. 1: Water vapor imagery in the W. Pacific. Ship location is approximated with a blue circle.



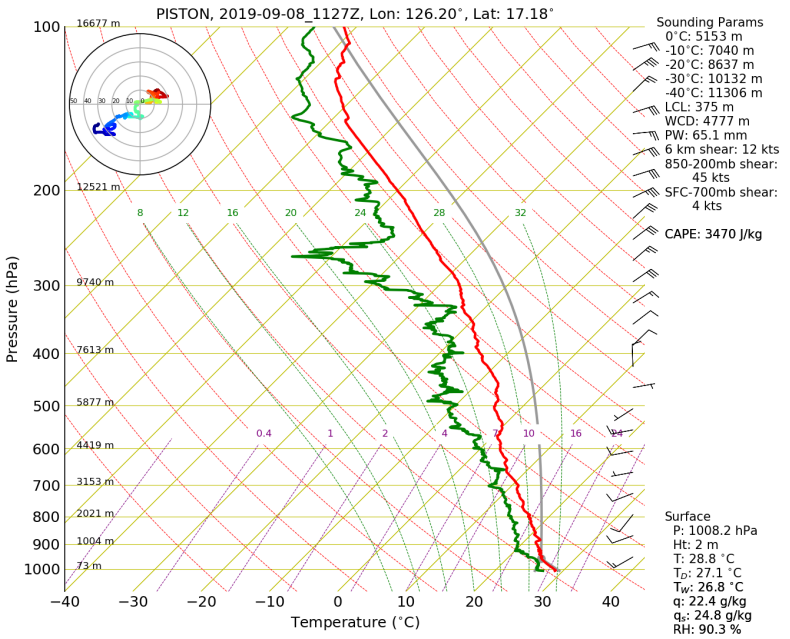


Fig 2.: 06 and 12Z soundings

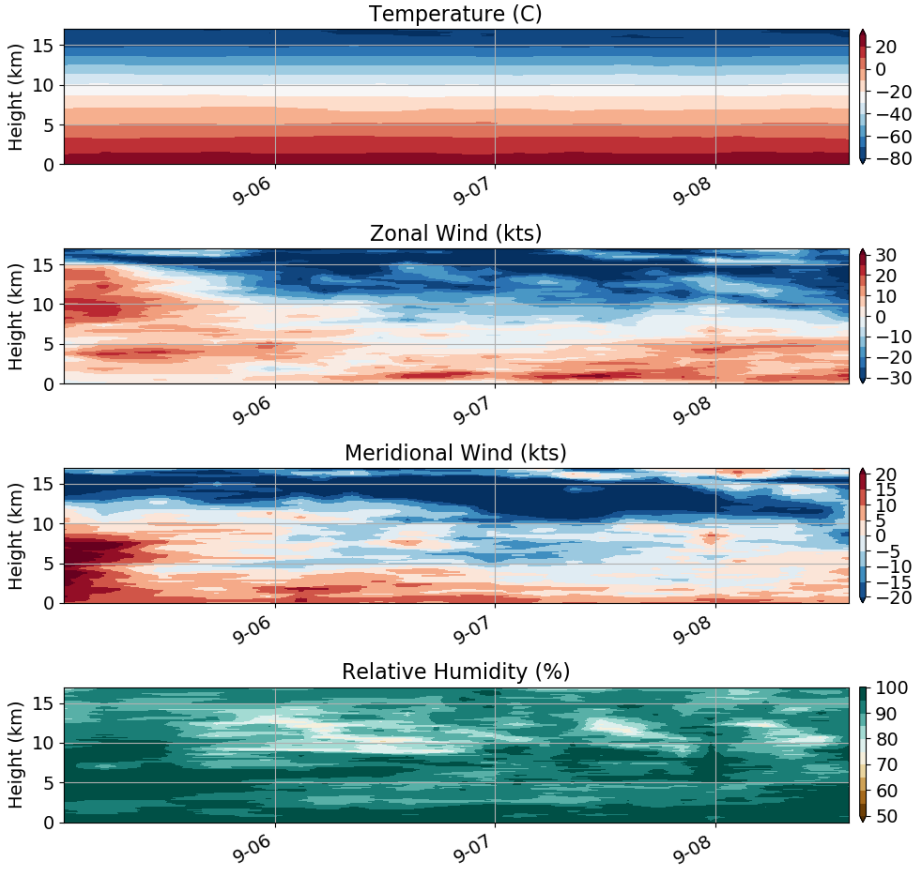


Fig. 3: Time vs Height plot of sounding variables

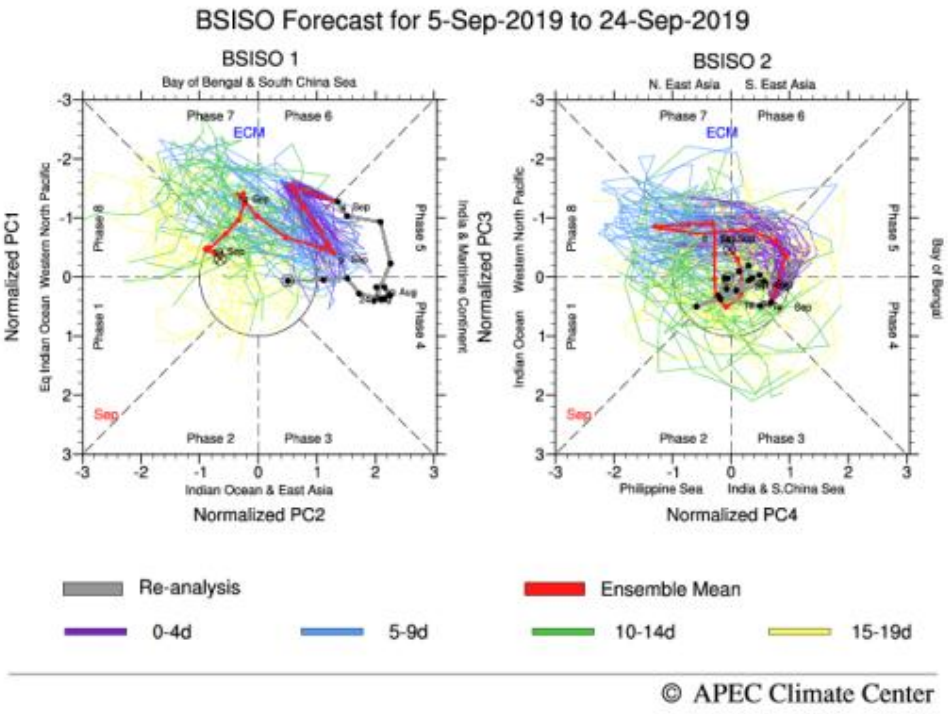


Fig 4: Model ensemble BSISO forecasts

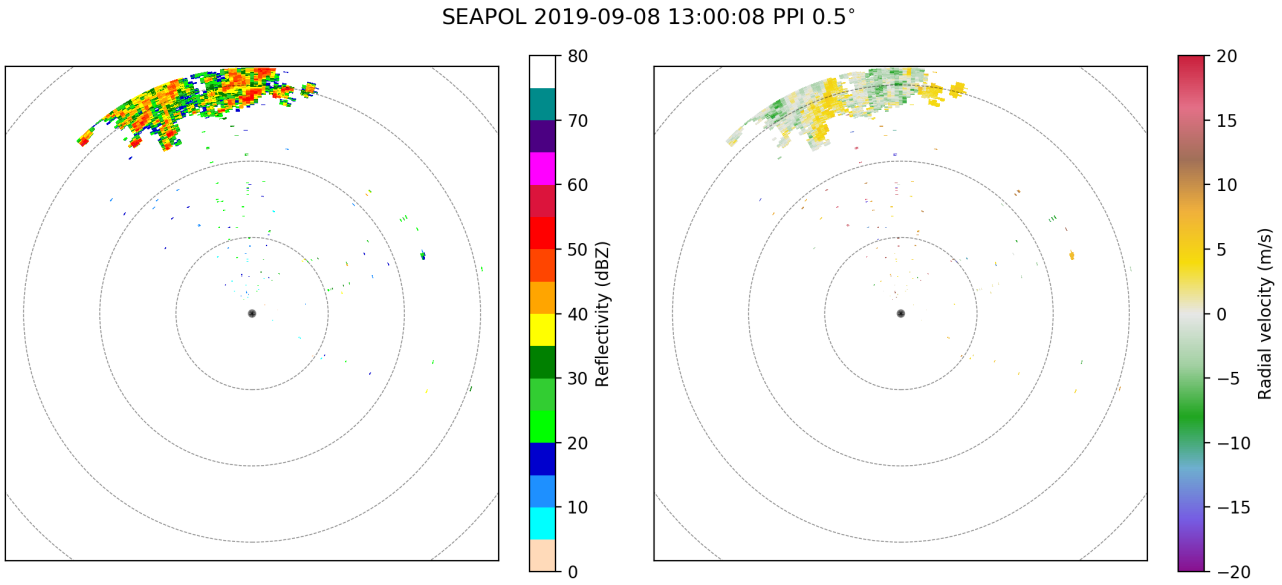


Fig 5: Northern line of storm complex barely in SEAPOL's view

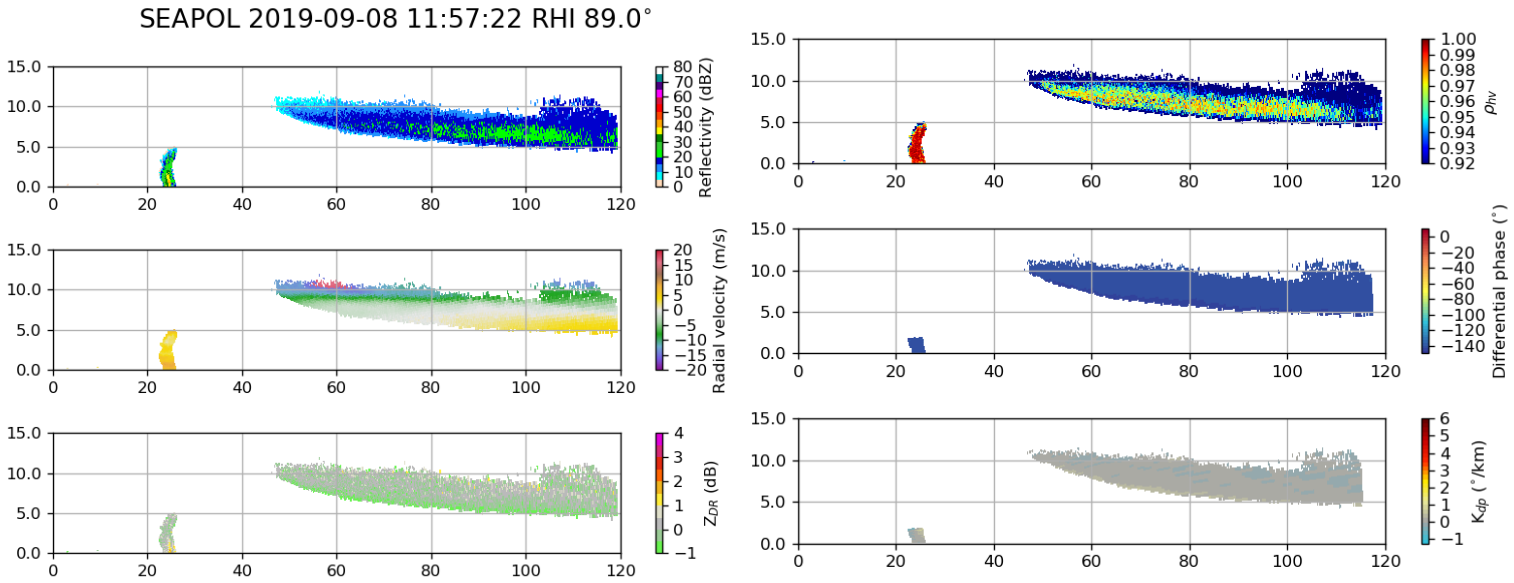


Fig 6.: RHI of an anvil from storm out of range to the easterly

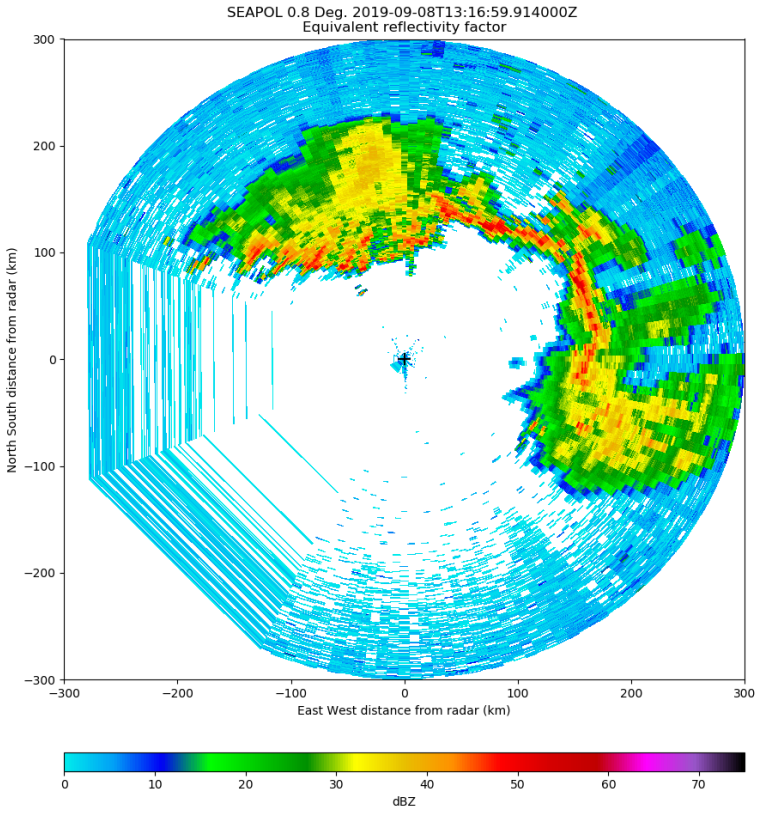


Fig. 7: Surveillance scan of storm complex

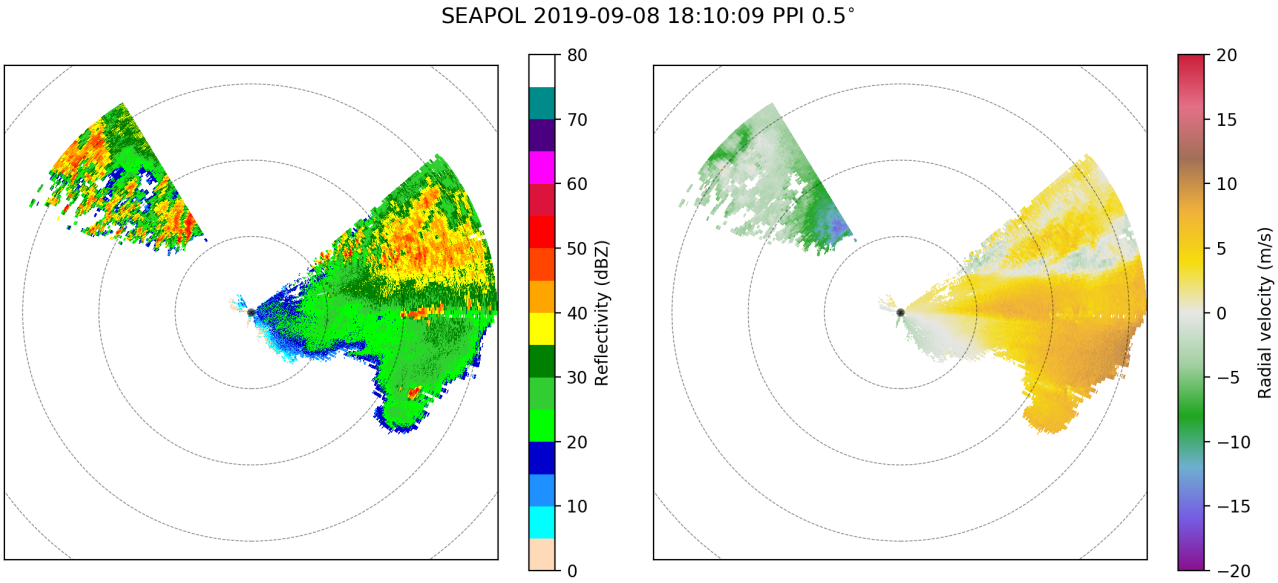


Fig. 8 MCS being blocked by blanking sector

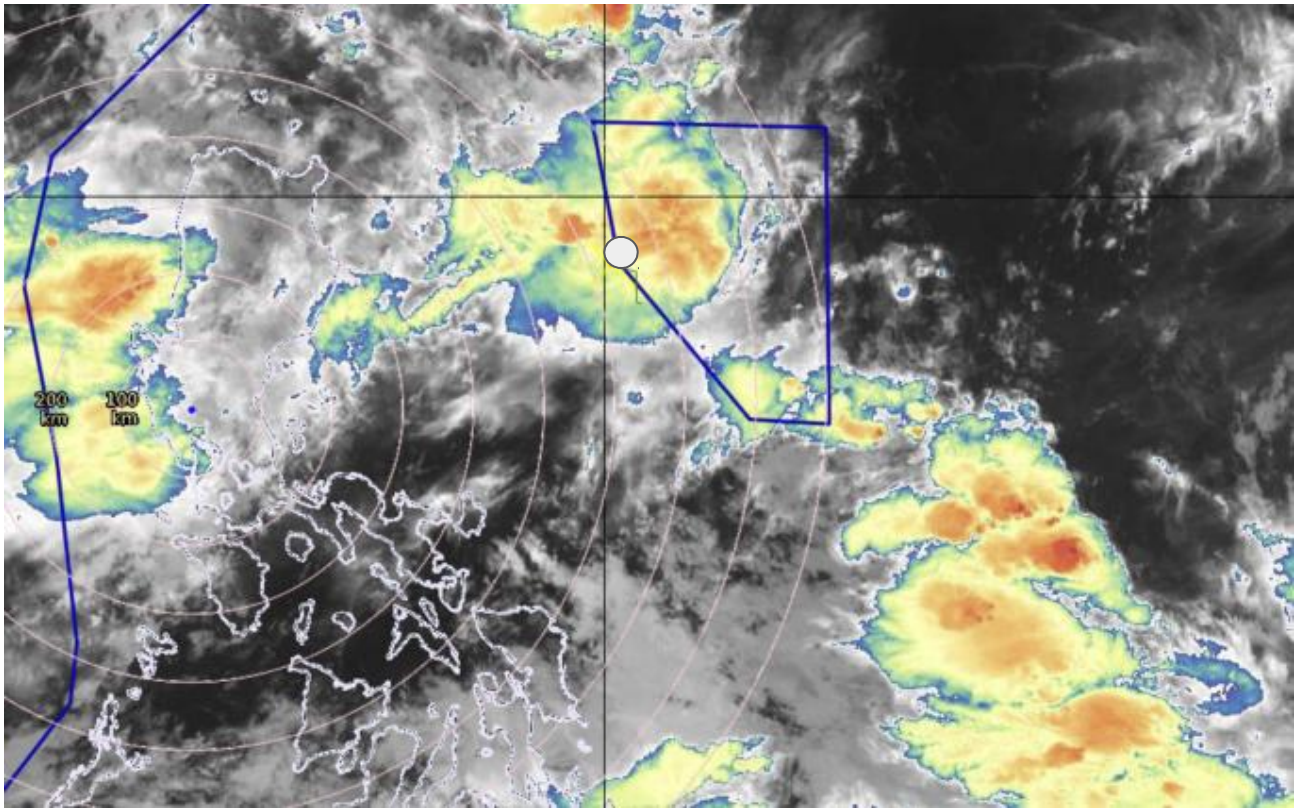


Fig. 9 11 micron IR Satellite imagery valid at 1827 Z, with the ship's position approximated with a white circle

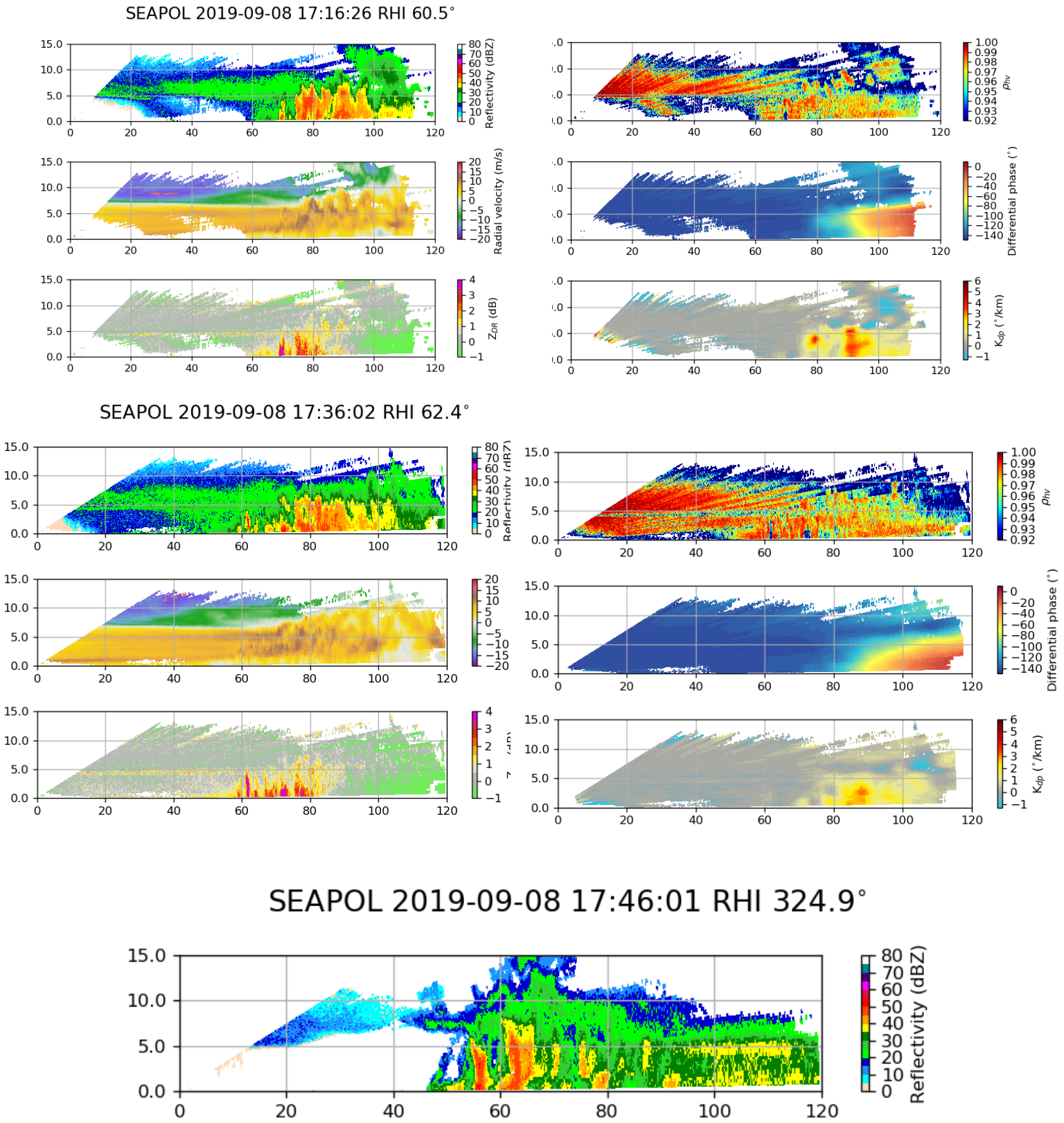


Fig. 10: Interesting RHI examples from the MCS

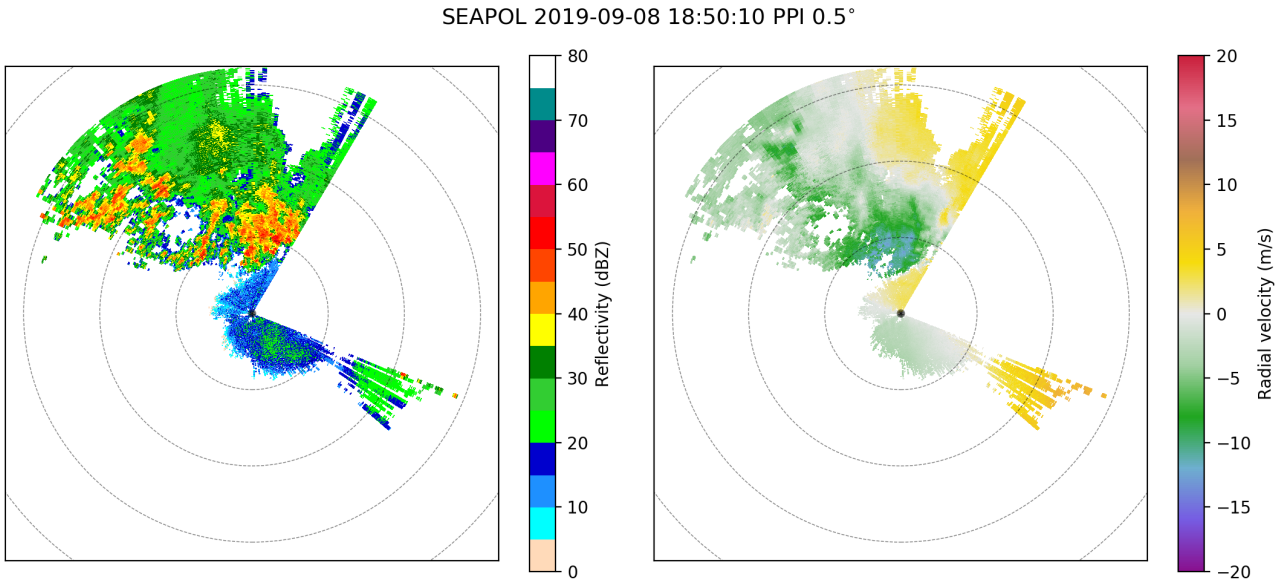


Fig. 11 A more complete view of the convective line