

CS99 (COSAT) OVERVIEW August 5 – September 4, 1999

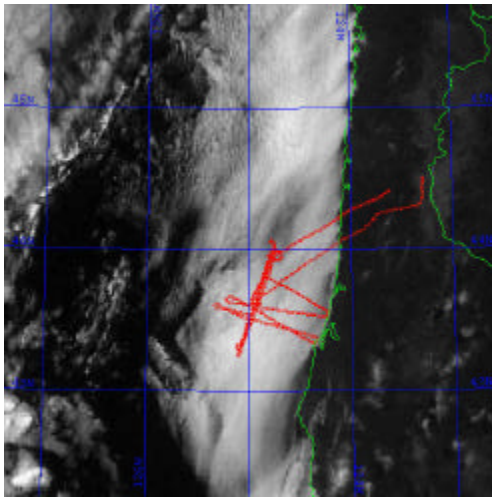
Low pressure area to NW remained in place for most of study period. Central Oregon coast was under the combined influence of this low and the subtropical high to the more distant SE. Northward extensions and periodic strengthening of the high along the coast produced changing conditions.

Sea surface temperatures ~5°C warmer than during 1995 UW field observations.

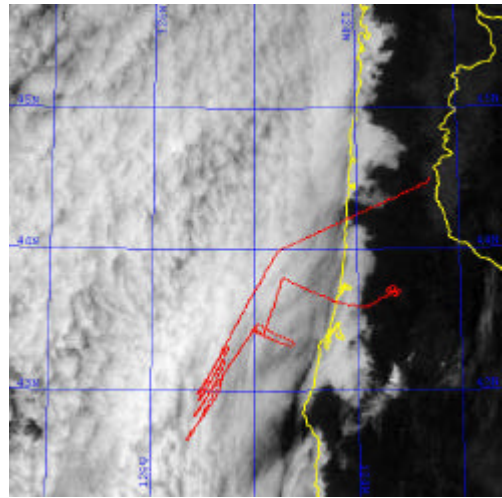
August 9, 10 and 11 sequence:

A sequence of rising inversion depth: 400, 600 and 1300 m. Cloud bases: 75, 200 and 950 m respectively.

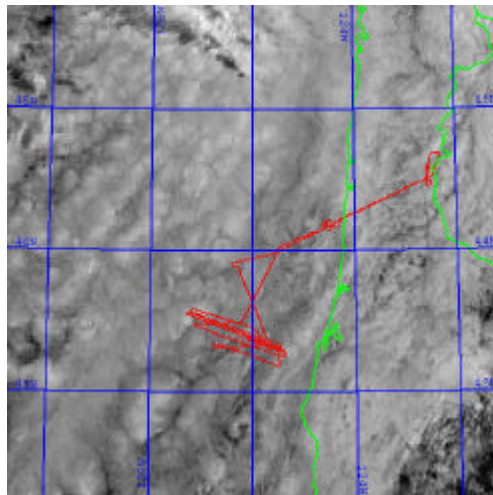
Cell sizes increase in parallel with deepening of BL. Also, intrusion of cloud over coast progressively increases.



990809 – 1900Z



990810 – 1800Z



990811 – 1630Z

Cloud base temperatures were near +13°C for the first two days, +8°C for the third. Cloud top about 1°C colder each day. Colder temperatures on third day represent significant change.

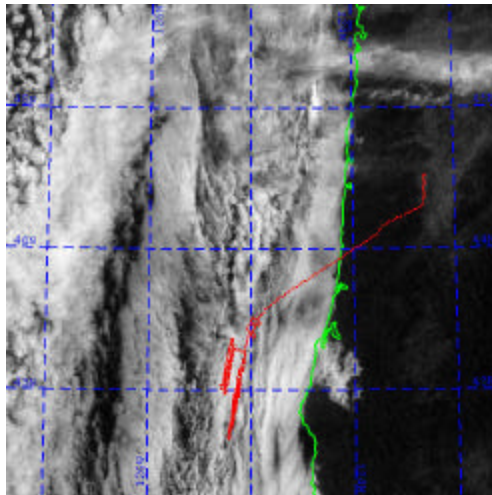
Inversion height had definite upward tilt toward the W on 990809 and 990810. On 990811 the observation region was at the edge of the zone of strong coastal influence.
 Optical depths of 20, 23 and 22 respectively.
 Winds were N during the first two days, shifted to 330° on the third.
 Some instrument difficulties make the data for this sequence incomplete. The greatest gap is the lack of particle spectra from the PMS probes on 990810.

August 16-17 sequence:

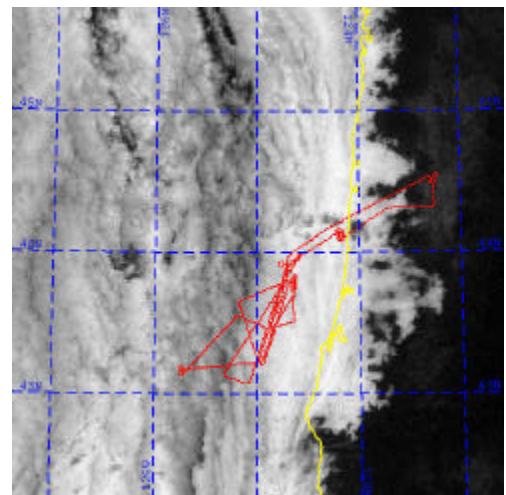
Another sequence of days with rising inversion depth, but only over 2 days. Cloud tops at 350 and 700 m, bases at 120 and 350 m. Inversion was much sharper on 990817: slope of ~50°C/km vs. -18°C/km.

Pronounced N-S bands of 2-10 km widths on 990816.

Emphasis on 990817 was on sampling clouds at various points throughout their depths. This was done with a large number of porpoising maneuvers. Individual profiles of LWC varied greatly, with LWP values ranging from 0.02 to 0.17 mm. The larger values are from the cloud band over the eastern part of the study region while the thin clouds were in the west (cf. sat. images).



990816 – 1630 Z



990817 – 1630 Z

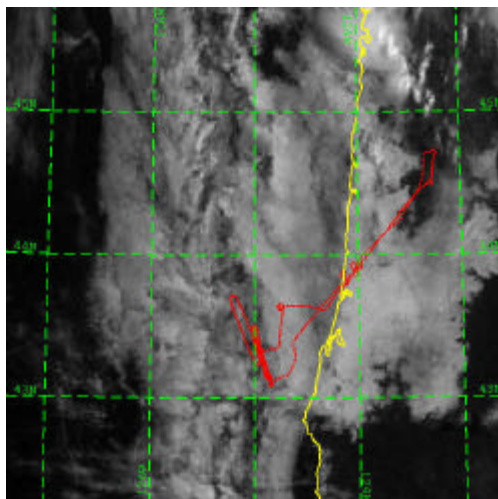
Near-surface temperature warmed about 1°C from one day to the next. Cloud top temperature dropped from 13°C to 10°C as inversion altitude increased. Max LWC differed little, Wind direction remained the same but speed changed from 10 to 5 m/s. Optical thickness <10 and 15 for the two days.

August 20:

Cloud tops at 800 - 900 m; weak inversion with no drying at all. Thin cloud layer (~50 m) at the inversion; deeper cloud merging into it from below. Main echo tops are clearly domed, with >50 m variation.

Heavy precipitation. Reflectivities to +10 dBZ. LWC maxima only 0.4 g m⁻³; LWC altogether quite sporadic – cloud seems to be precipitating/dissipating.

Sub-cloud lapse rate of -8°C/km, in-cloud about -6.5°C/km. Cloud top temperature 11°C.



990820 – 1700 Z

Observation area covered part of more solid band near coast and more broken cloud field further offshore. Optical thickness: 5-10.

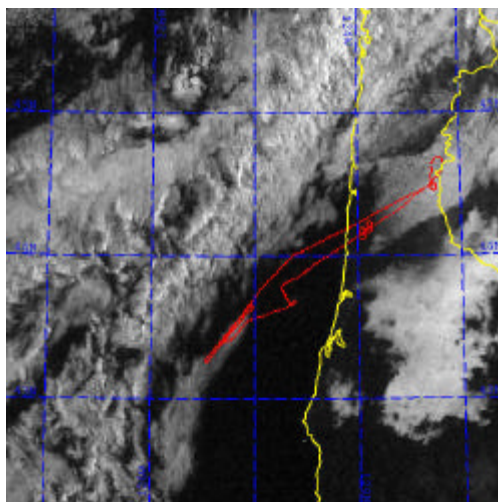
August 21:

Very thin cloud layer (a paper thin 100 – 160 m) extending in a narrow band from the SW to NE in otherwise clear zone. More substantial clouds another 30 km to the W but not sampled.

Nearly adiabatic profiles of LWC, practically no drizzle notable. Reflectivities to –20 dBZ, with the maxima near cloud top. Yet virga-like radar echo extensions discernible. At least in the upper regions of the cloud, the reflectivities depict cloud structure: images resemble satellite images or photos of cloud tops.

Most remarkable are the frequent occurrences of narrow regions with downward moving air, increased lwc, increased mean drop size and decreased temperatures!!

Cloud weakened with time, and completely dissipated shortly after the flight.

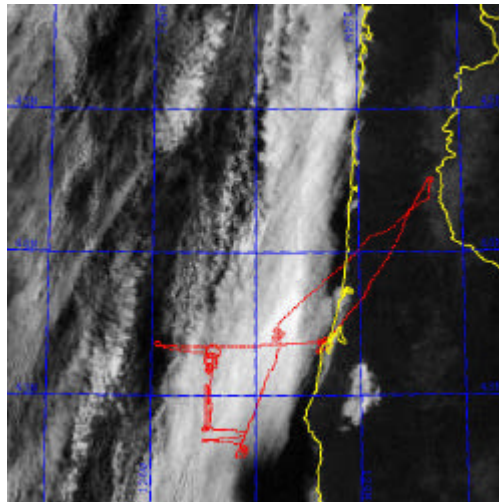


990821 – 1630 Z

August 24:

There were two flights this day, one in the morning, one late afternoon. Band of cloud off the coast in the morning, none directly over the shoreline. NE-SW 'streaks' extend from the coast toward the band - this feature was also noted on other days.

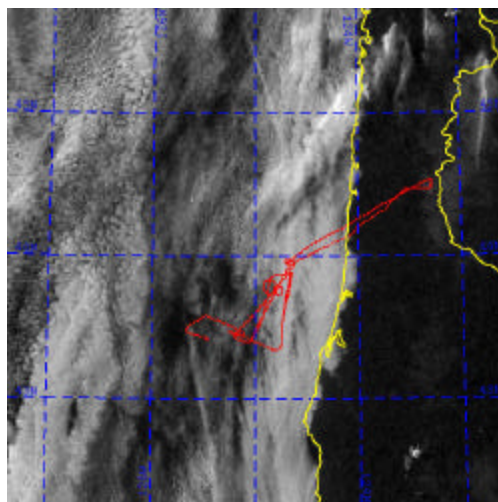
The morning flight was only the second stratus case without appreciable drizzle. The other one was 990821. This case is more surprising, because the cloud was twice as thick as on 990821 (about 200 m vs. 100 m depth). Also, this cloud is quite homogeneous both visually and in reflectivity. Radar echoes depict cloud structure not drizzle regions. Features to be noted in the radar images are small 'holes' and 'veins'.



990824 – 1800 Z

Inversion height of 600 m during the morning flight was near what it was on 990810. LWC was also similar, yet there appears to be a considerable difference in drizzle formation. The reason for this difference may be interesting to explore.

The second flight of the day encountered thin fog or dissipating cloud which extended from the surface to a variable height of only 150 – 250 m. Rainbows evidenced sparse cloud with large drops.



990825 – 0100 Z

August 23:

Clear air study to depict coastal jet.

August 25:

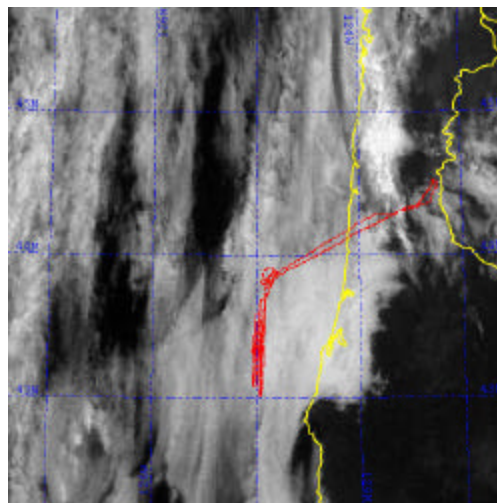
Instead of thickening overnight, cloud was found to be a complex mix of fog and multiple layers.

August 26:

Clear air study for Tom Parish.

August 28:

Very similar situation to 990817. Stratus is quite uniform with no obvious cellular structure, but with N-S bands. Optical thickness of 20. Cloud top at 12°C.

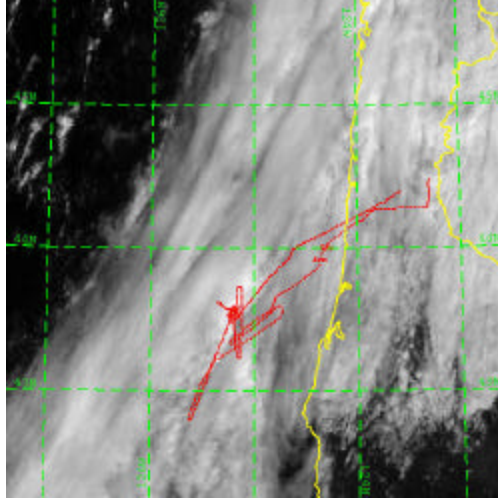


990828 – 1800 Z

Radar echoes reveal areas where cloud droplets dominate (reflectivity increases with height) and others where drizzle is evident.

August 29:

Inversion got washed out by strong cooling aloft. This led to nearly uniform near-neutral lapse rate all the way to 4 km altitude. Wind veered from N to S, most shear between 1.5 and 2.5 km.



990829 – 1800 Z

Multilayer cloud structure, higher cloud encroaching from the W.
Strong echoes developed in lower cloud layer in distinct cells. Fine structure in both layers is interesting and may be linked. Some patches of significant updrafts noted in the upper layer.
Cloud tops of upper layer were sampled to examine entrainment interface.
Presence of As patches above the sampled clouds is a problem for satellite retrieval.