

13 July 2002 Mission Report

Summary:

Today's flights provided extensive samples of thin cirrus near the cold tropical tropopause in the southern FL region. Optically thin cirrus was present within a few thousand feet of the tropopause throughout the flight. The Twin Otter flew below the ER-2 flight track to make radiation measurements underneath the thin cirrus. Forecast outflow from convection on 12 July was sampled over the Gulf. At the beginning of their flights, the ER-2 and WB-57F flew in a wingtip-to-wingtip formation at 50 kft to compare water vapor, temperature, and radiation measurements. The WB-57F flew through its own persistent contrail at the tropopause for about 20 minutes. The P-3 made measurements along the edge of maritime convection north of Naples. No significant Cb-anvil systems formed over southern FL.

Forecast:

The models predict unusually cold tropopause conditions in the FL region, with temperatures below 197 K. These conditions are conducive to *in situ* formation of thin cirrus near the tropopause. Trajectory analysis suggests that air injected near the tropopause by deep convective systems near Miami on the previous day should be in the region W to NW of Key West. The lower-mid troposphere is relatively dry, suggesting suppressed convection.

Approximate flight times:

	Takeoff	Landing
ER-2	1300	1915
Proteus	1220	1930
WB-57F	1300	1830
Twin Otter	1230	1700

Report:

The ER-2 and WB-57F took off as scheduled and met west of Key West to set up the formation flight leg. They flew wingtip-to-wingtip NW for about 15 minutes at 50 kft to compare water vapor, temperature, and radiation measurements. Next, they headed off to the east, with the ER-2 above the WB-57F and the WB-57F just above the tropopause. Over the next few hours, diffuse cirrus was sampled by the WB-57F from the temperature minimum at about 50 kft down to as low as 46 kft.

The ER-2 flew along the same path the WB-57F for most of the flight. The Cloud Physics Lidar (CPL) on the ER-2 indicated that thin cirrus was present in the top 1 to 2 km of the troposphere throughout the flight (see image). Occasionally, optically thicker cirrus was present just below the thin layer at the tropopause. The Proteus flew along the

same track as the ER-2. The Twin Otter flew under the ER-2/WB-57F track at 11.5 kft for part of its flight, and the thin cirrus was apparent in the zenith radiative flux measurements.

At one point, the WB-57F made its dog-bone turn and flew in its own contrail for 20 minutes (the contrail age was as old as 40 minutes). This leg should provide an excellent case study for persistent contrail microphysical evolution. The persistent contrail was readily apparent to the pilots of the WB-57F, Proteus, and Twin Otter.

In addition to making radiation measurements under the thin cirrus, the Twin Otter also penetrated three small cumulus clouds near the western ground site.

The P-3 sampled the southern edge of a maritime convective system streaming onshore north of Fort Meyers, but no significant convection/anvil systems sprung up over the southern peninsula.

