**POSIDON Science Flight Report**

**2016-10-19 RF05**

**Takeoff: 0302 UT October 19 (13:02 Oct 19 Guam local)**
**Landing: 0842 UT October 19 (18:42 local), duration: 5.7 hours**
**Mission Scientists: Eric Jensen, Ru-Shan Gao**
**Pilots: Gregory Johnson, Cary Klemm**

**Summary:**

This flight provided additional sampling of TTL trace gases and cirrus in air perturbed by typhoon Haima as well as water vapor concentration across a horizontal temperature gradient.

**Flight Description:**

On the morning of the flight, typhoon Haima was situated west and slightly north of Guam (Figure 1). The flight path took the aircraft south of the typhoon across a forecast gradient in tropopause temperature where TTL cirrus and dehydration were expected. The GOES5 chemical transport model still predicted enhanced $SO_2$ from Asian pollution on the west end of the flight track.

The aircraft initially headed west and ascended to about 56 kft, followed by a descent to 49 kft. Porpoising through the TTL continued as the aircraft headed toward the far west waypoint, with the top altitude increasing to 57 kft as fuel depletion permitted.

Little or no cirrus was detected most of the way toward the west end of the flight track. However, the tropopause region temperature decreased as the aircraft headed west, and cirrus was detected from the cold-point tropopause down to the bottom of the profile near the west end of the flight track. At the west end turnaround point, the aircraft stayed at 45 kft for some time for the MMS box, pitch, and yaw maneuvers. On the trip back toward Guam, the TTL cirrus disappeared as the temperature warmed up.

Anomalously high ozone mixing ratios (~60 ppbv) in the TTL were present during most of the flight except at the far western end of the flight track (Figure 2). The profile of ozone over Guam from the WB57 spiral down before landing agreed well with the ozone sonde launched at about the same time (Figure 3). The ozone sonde launched at Palau (7.5°N, 134.5°E) on this day also showed high ozone in the TTL, thus the enhanced TTL ozone was present over a wide geographic area southwest of typhoon Haima. One possible explanation is Asian pollution transported upward by the typhoon and detrained into the TTL. Enhanced $SO_2$ concentrations detected on the previous flight were not apparent at the west end of this flight track.

All instruments performed well.

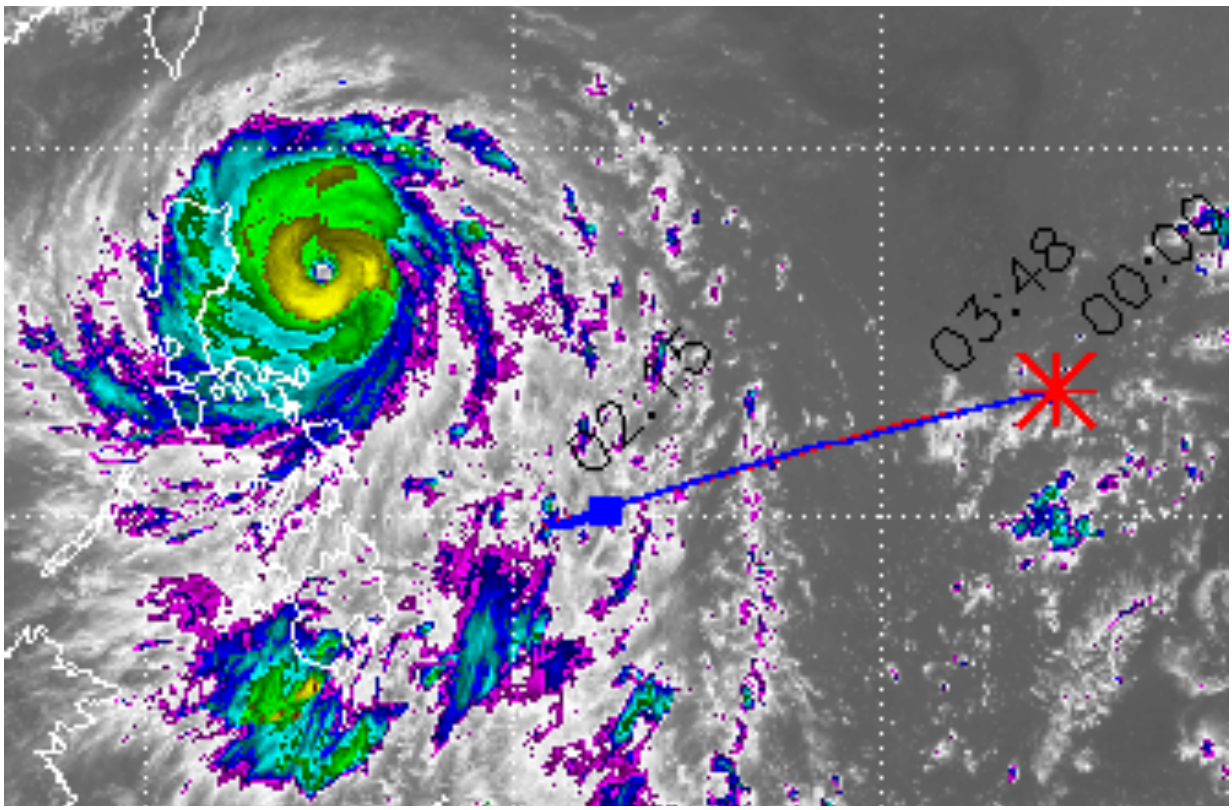


**Figure 1.** Infrared satellite image during the sampling of cirrus and trace gases south of tropical cyclone Haima. The red asterisk shows the location of Guam, and the flight path is shown in blue.

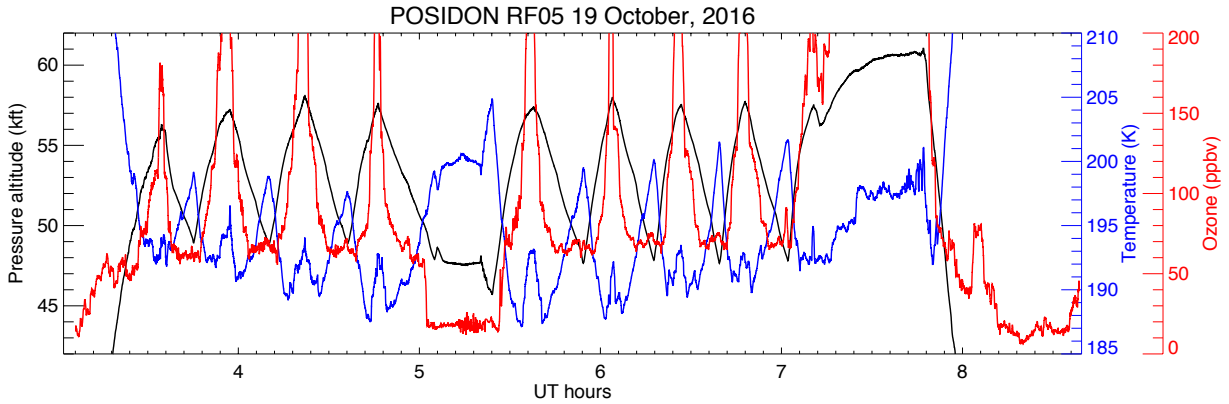


**Figure 2.** Time series of geometric altitude, static temperature, and ozone mixing ratio.

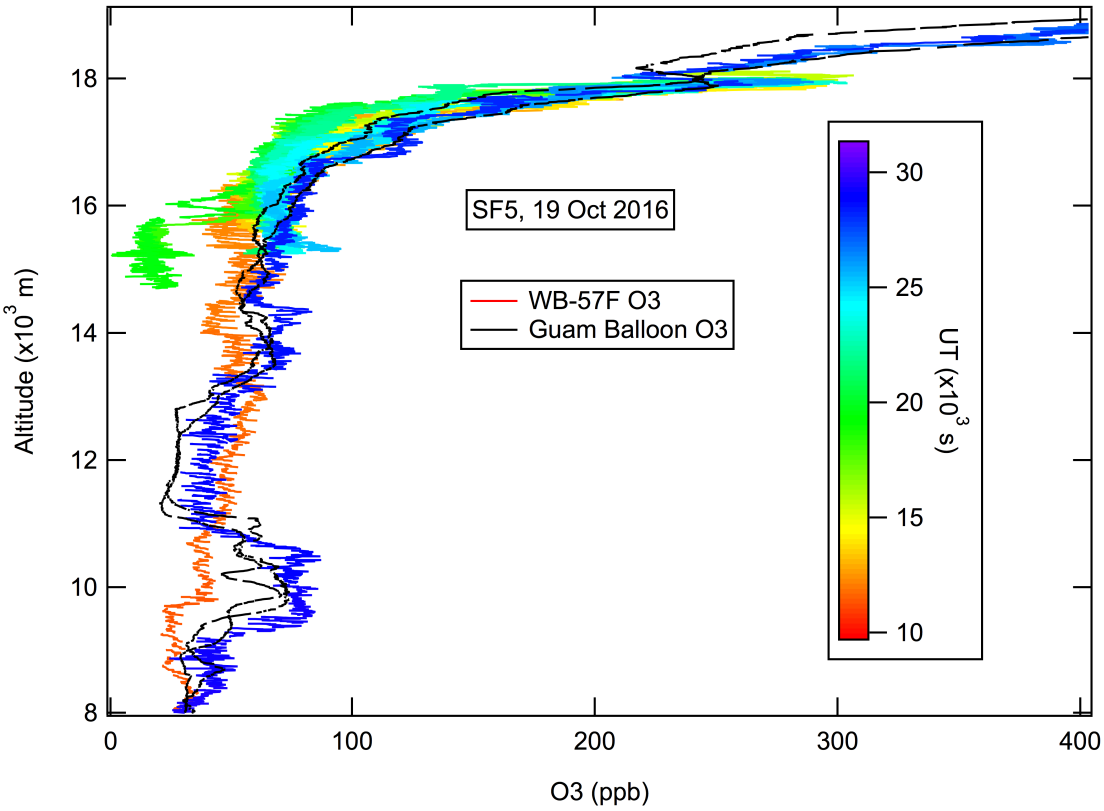


**Figure 3.** Ozone vertical profiles from the NOAA ozone instrument on the WB57 (colored trace, color-coded by flight time) and the ozone sonde at Guam coordinated with the WB57 landing (Courtesy Allen Jordan and Emrys Hall).