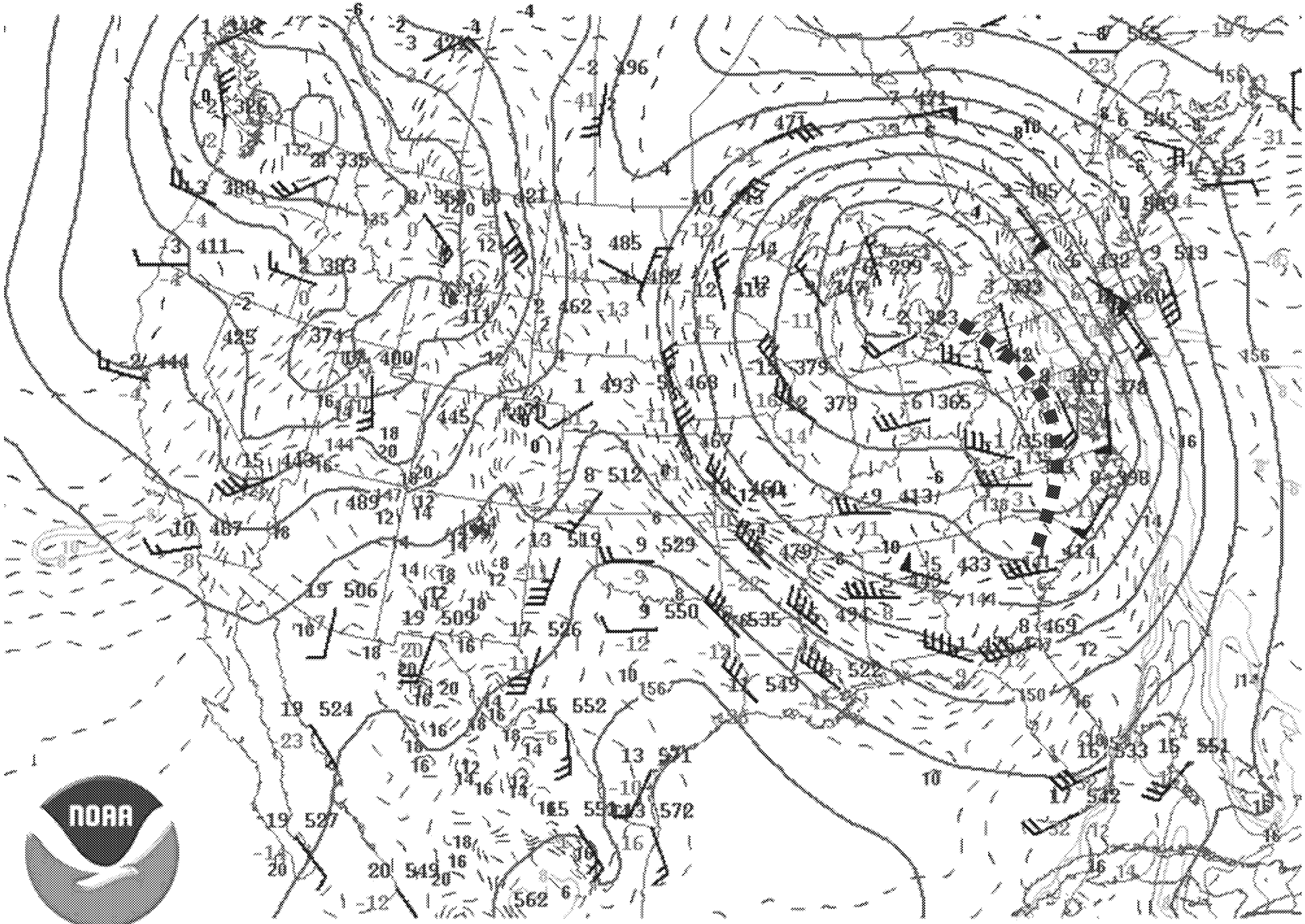
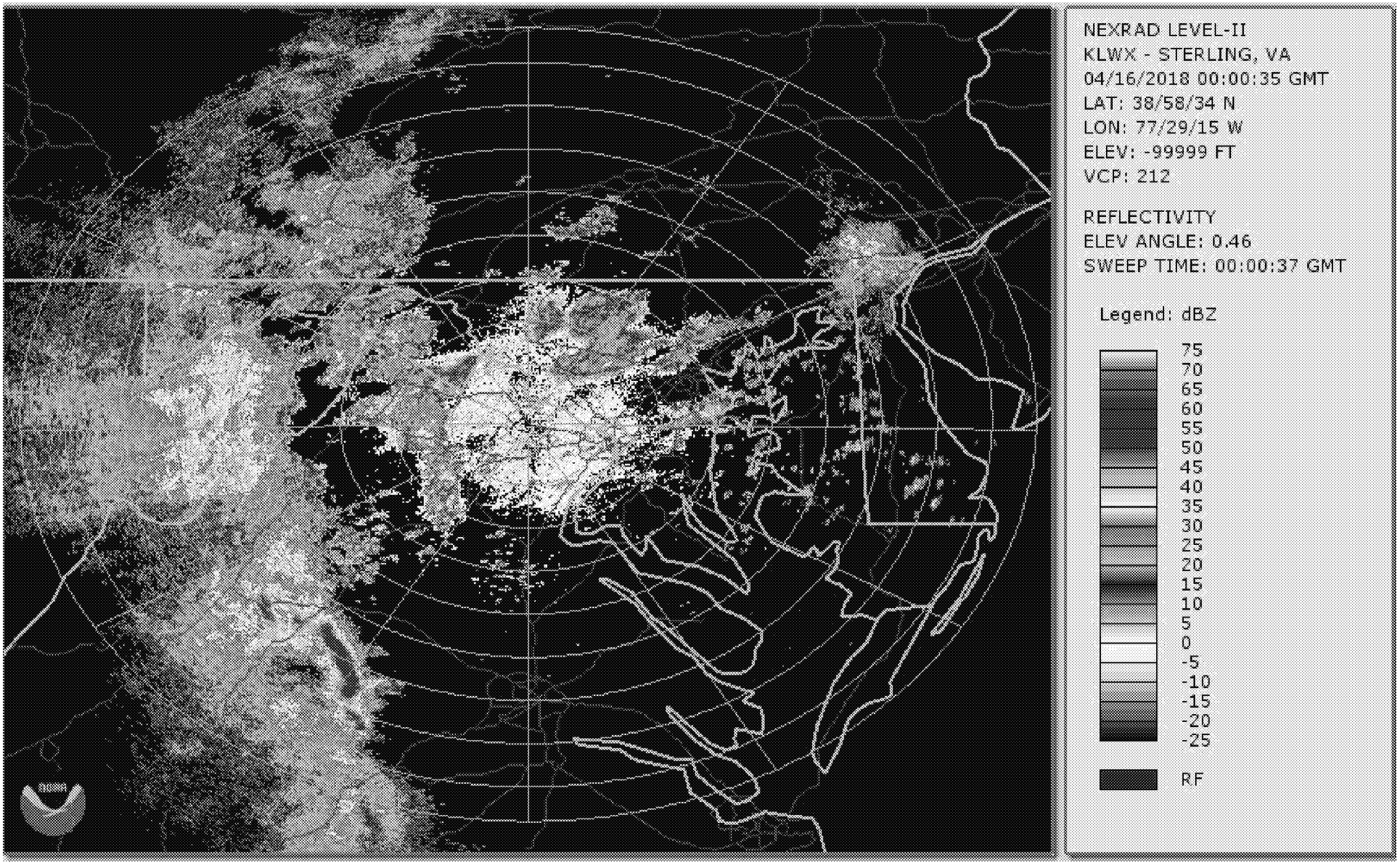
Stratospheric Ozone Intrusion
April 16, 2018



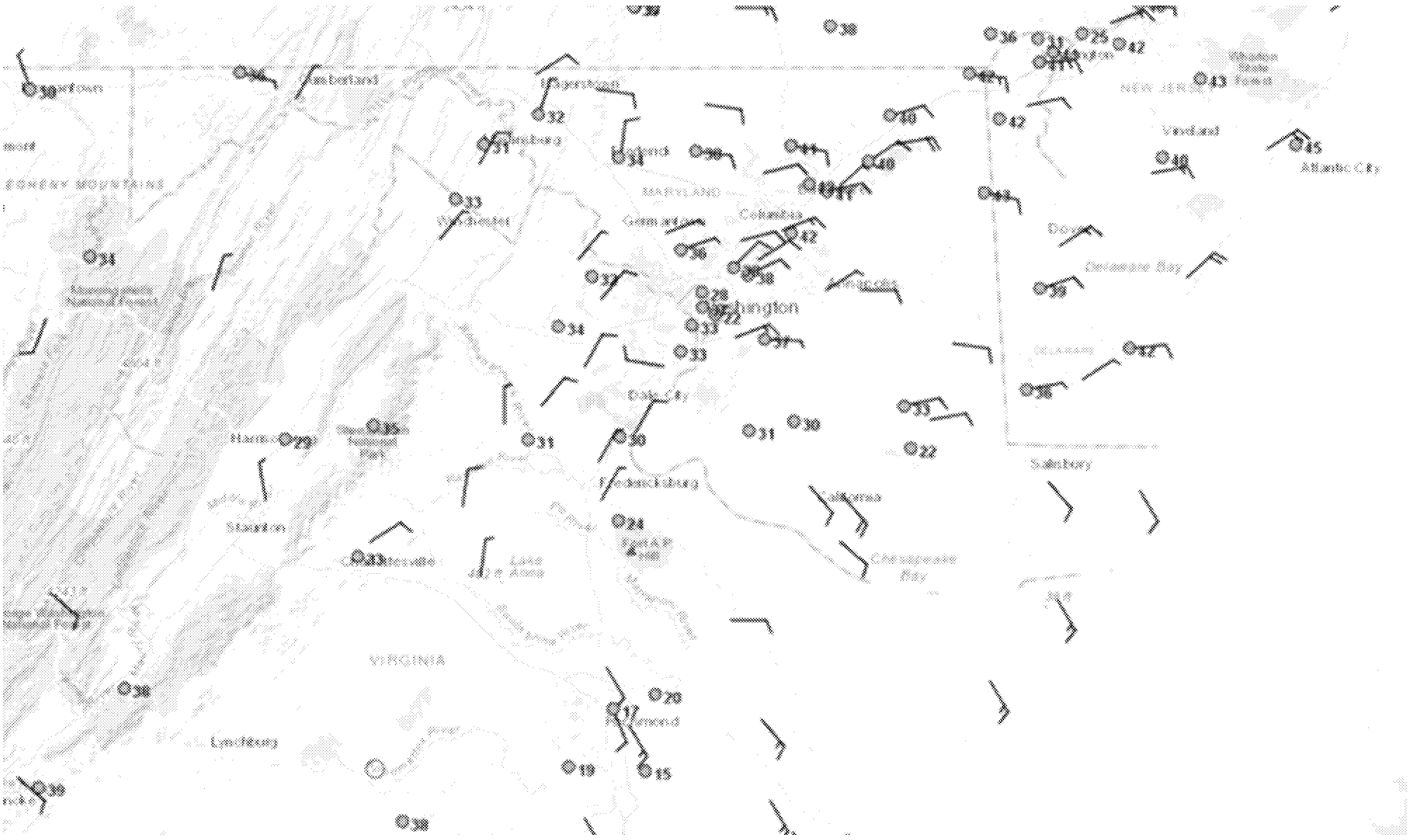
National Weather Service
Storm Prediction Center

180416/1200 850 MB UA OBS, HGHTS, TEMPS, Td>=8

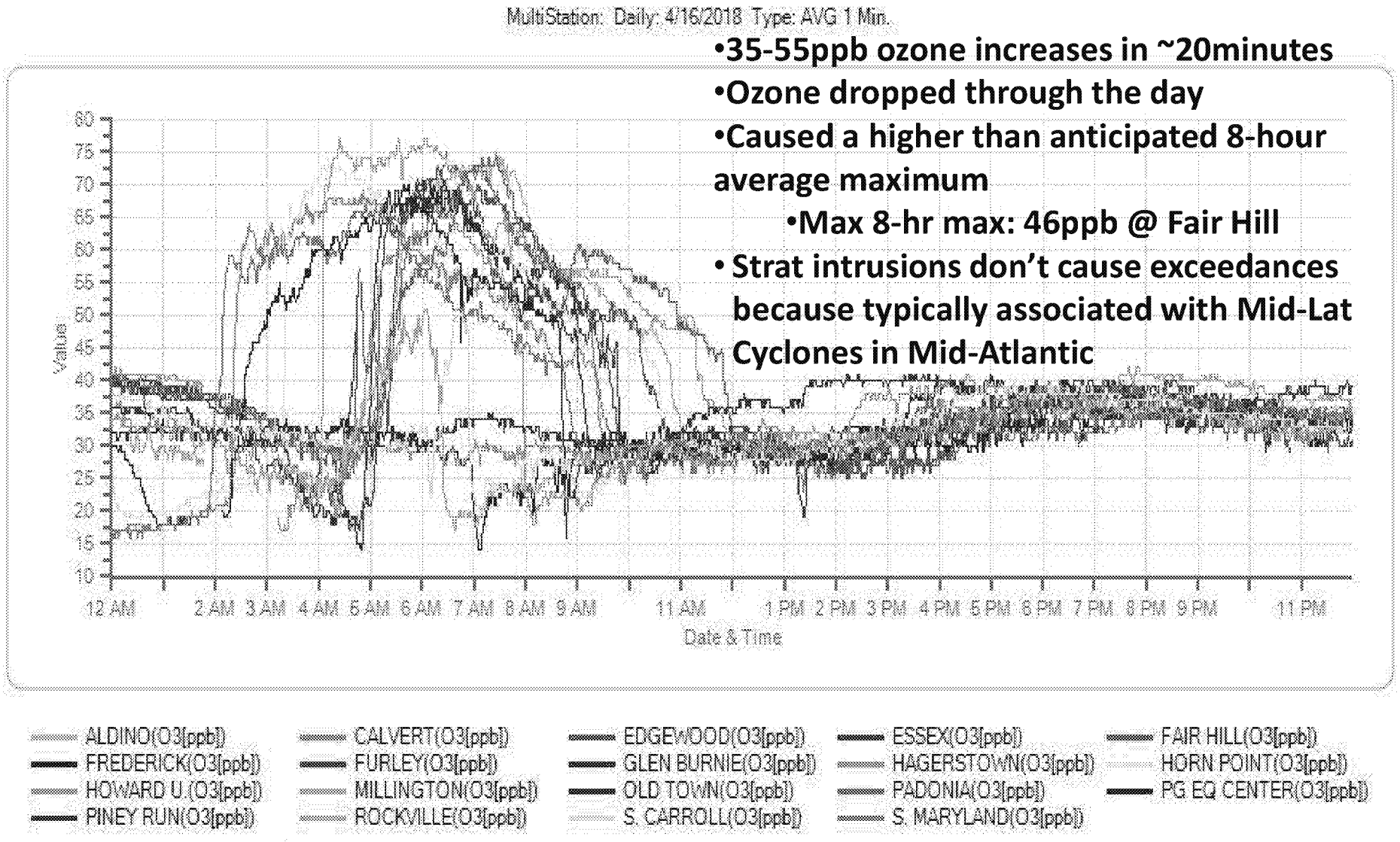
Sterling Reflectivity



Airnow Surface Ozone Observations
April 15, 11pm – April 16, 10am, 2018



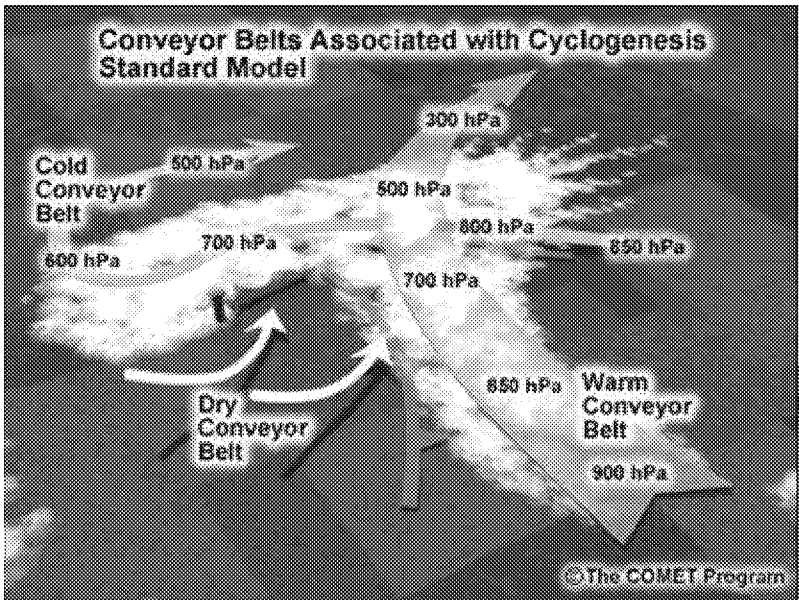
MDE Ozone Time Series [minute]

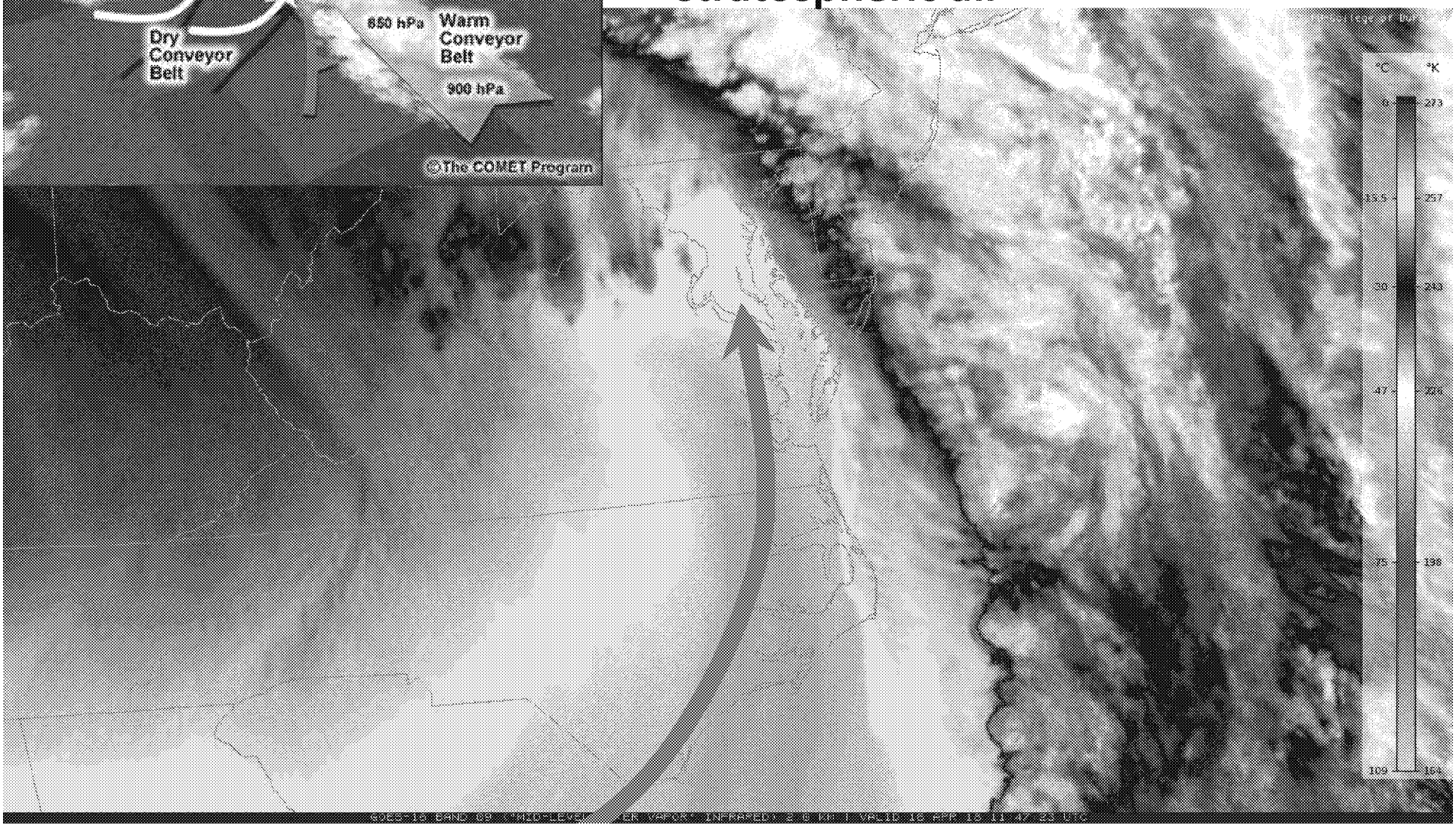


- **35-55ppb ozone increases in ~20minutes**
- **Ozone dropped through the day**
- **Caused a higher than anticipated 8-hour average maximum**
  - **Max 8-hr max: 46ppb @ Fair Hill**
- **Strat intrusions don't cause exceedances because typically associated with Mid-Lat Cyclones in Mid-Atlantic**

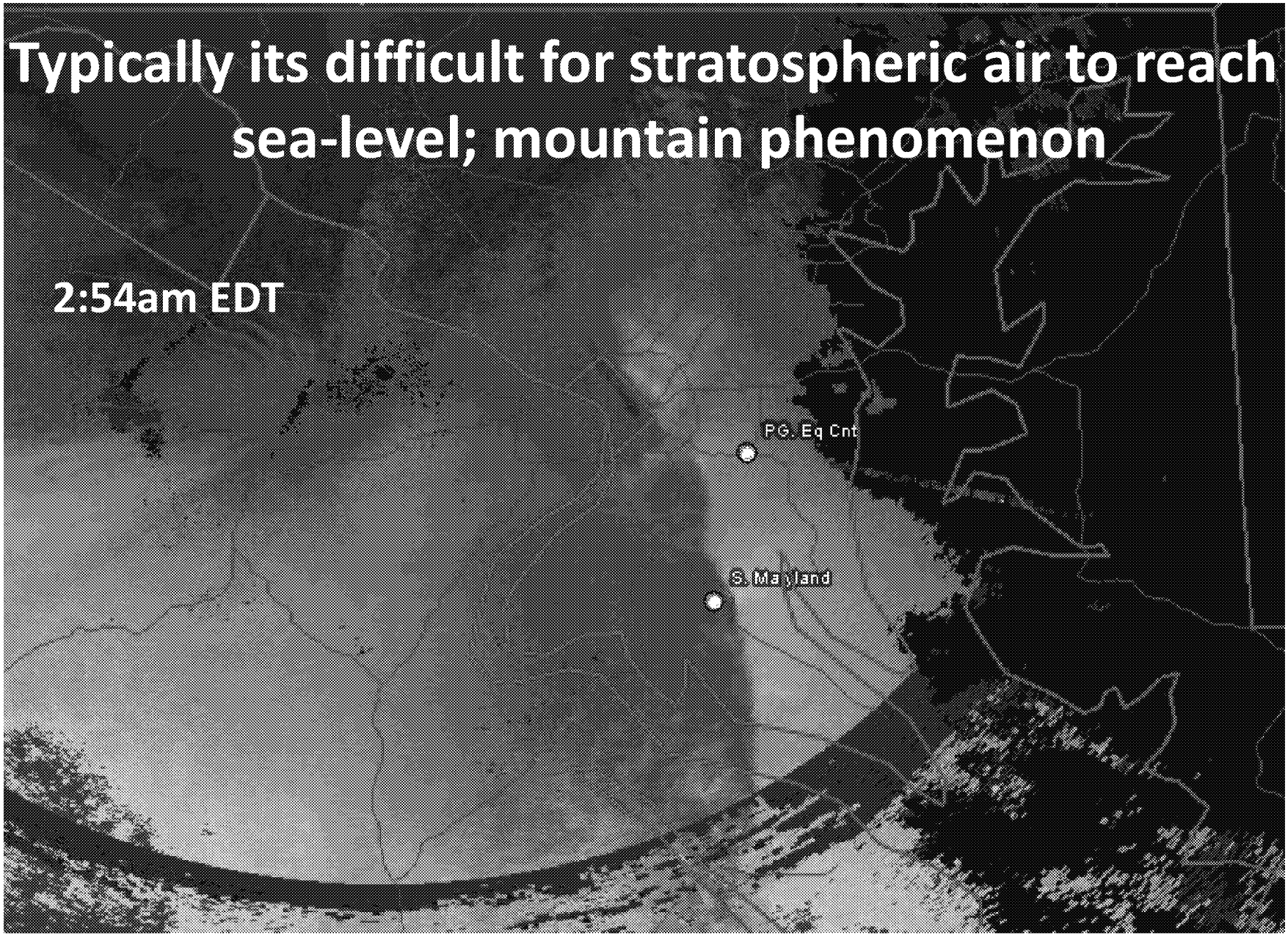
What Happened?

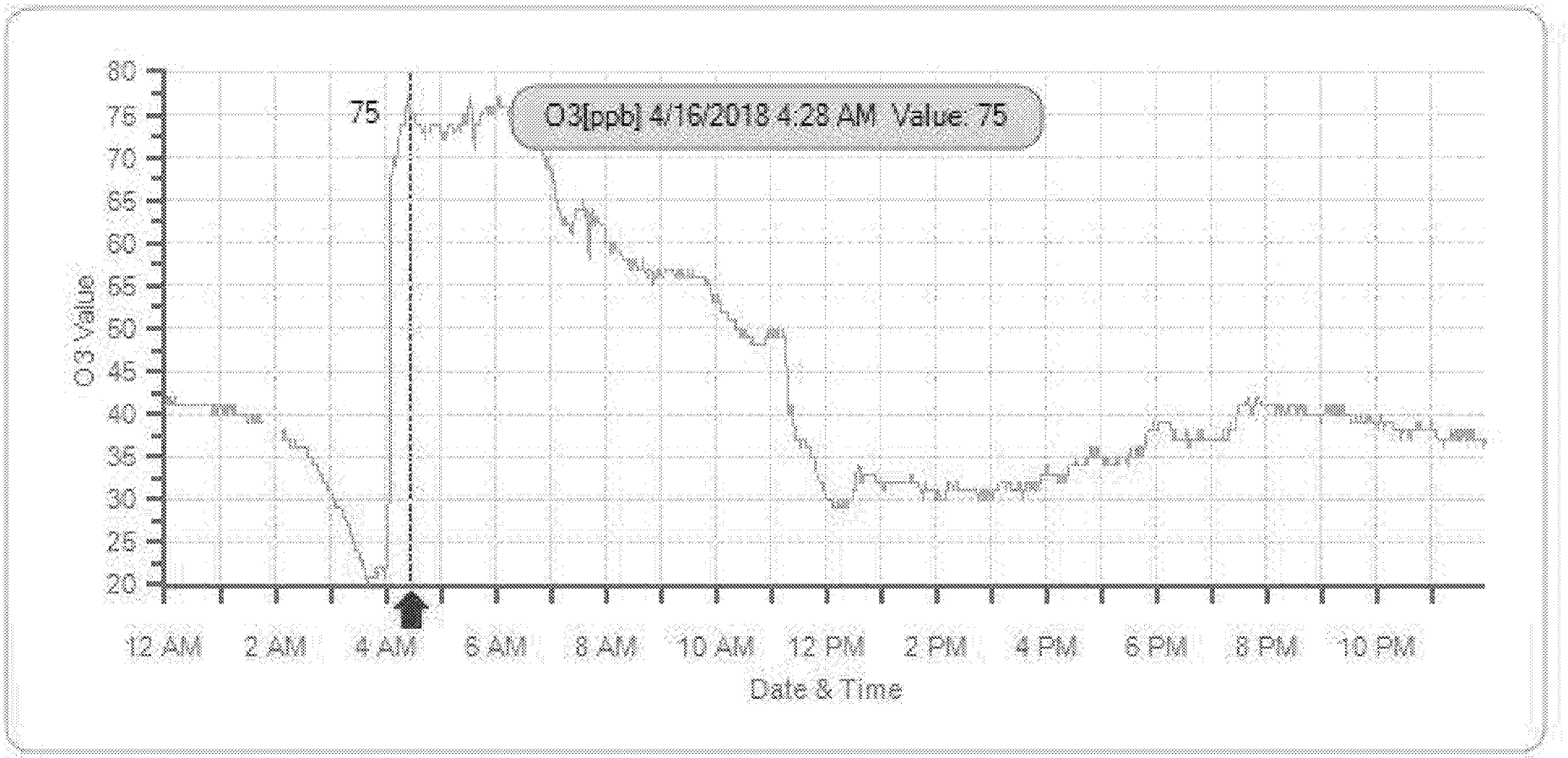
Dry slot – descending motion from upper troposphere; indicates likely stratospheric air





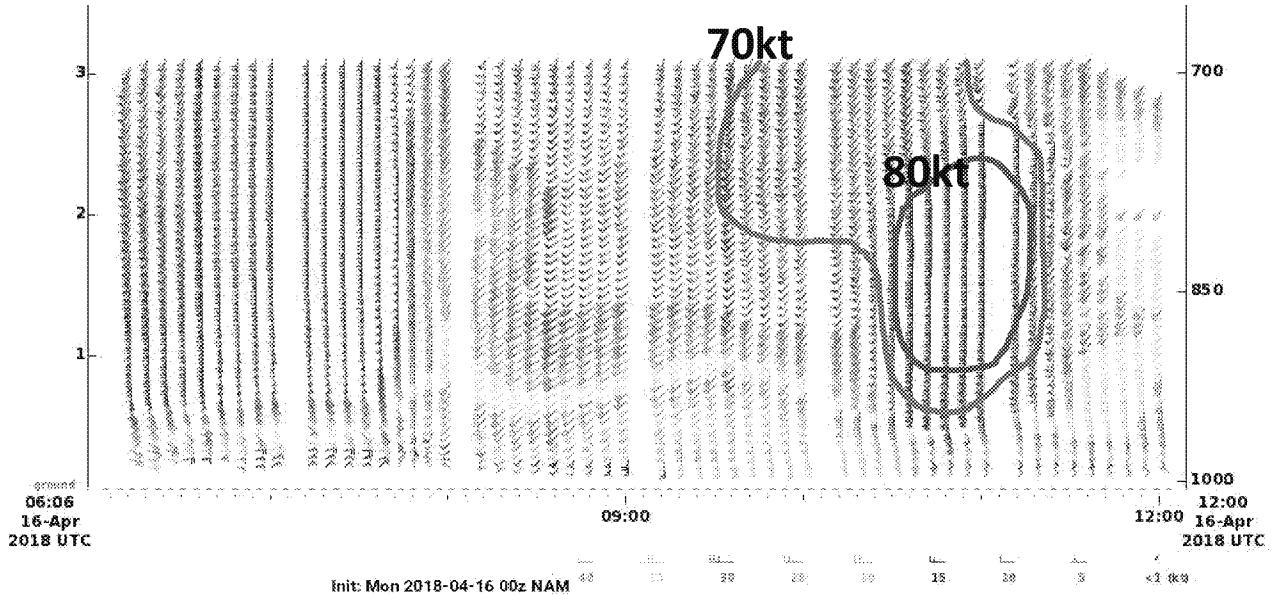
What Happened?

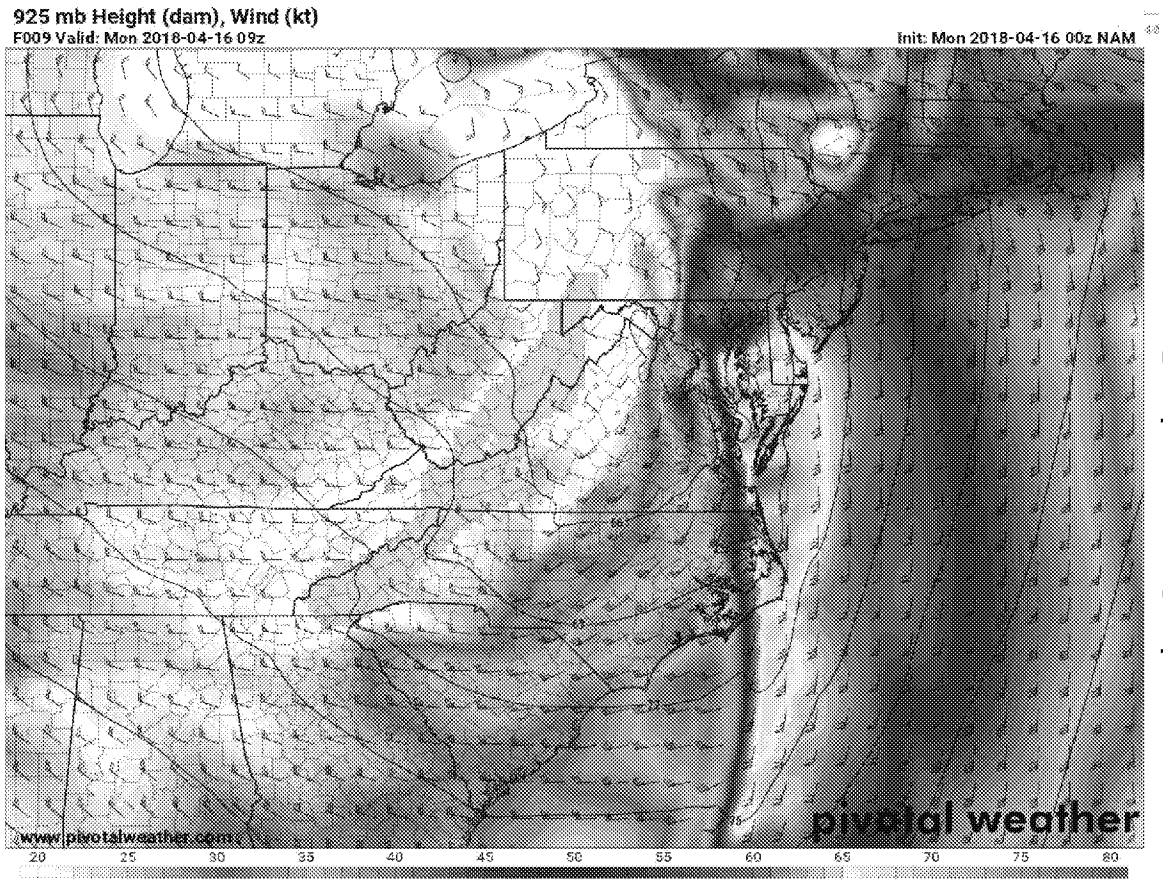




40-55ppb magnitude jump in ozone with gust front

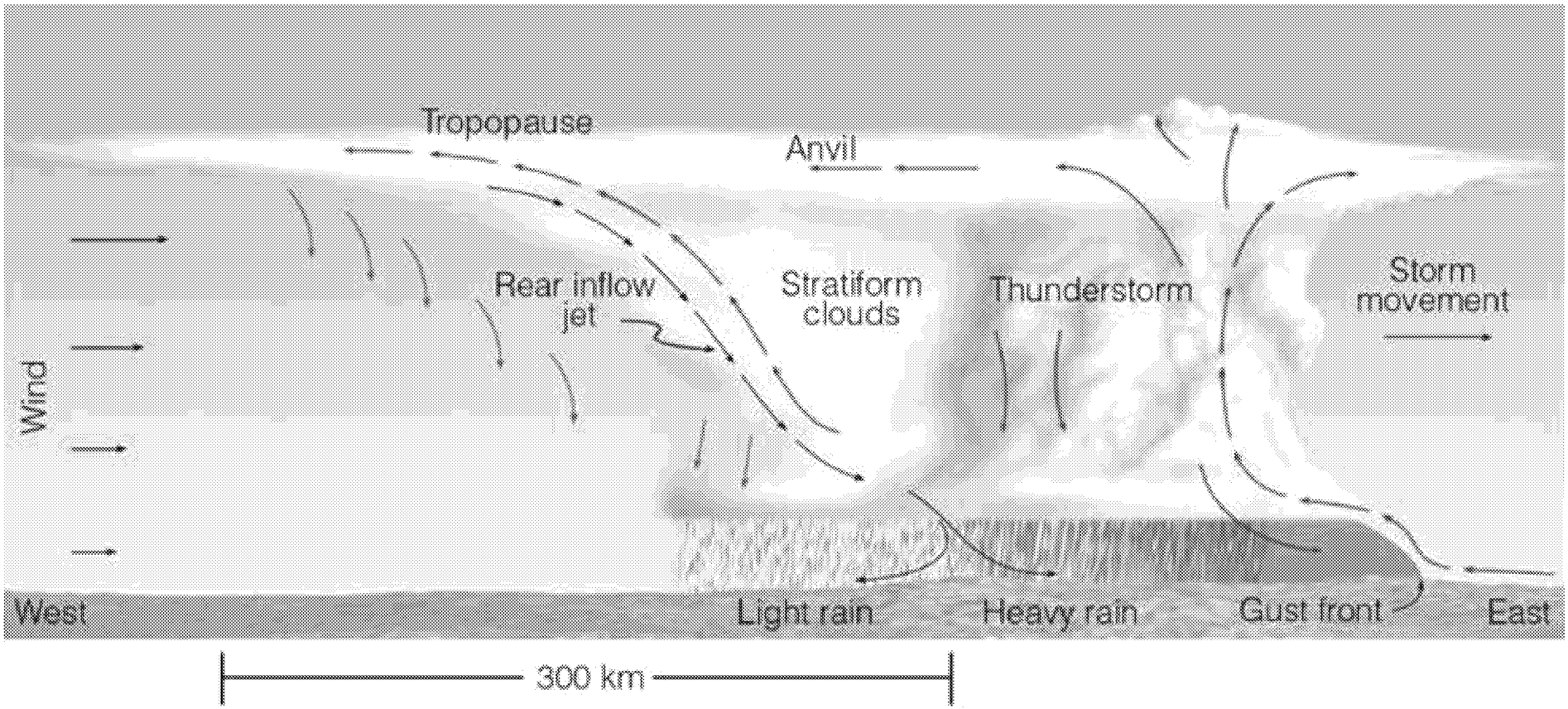
- Extremely Strong Jet **[80knots at 1km!!!!]**
- Jet strengthened over a short time period
- Induces vertical mass adjustments





- Thunderstorm downdrafts moved ozone to the surface
- Dynamic subsidence also moved ozone towards surface
    - Ozone remained until Cold front passed

Rear-Inflow Jet



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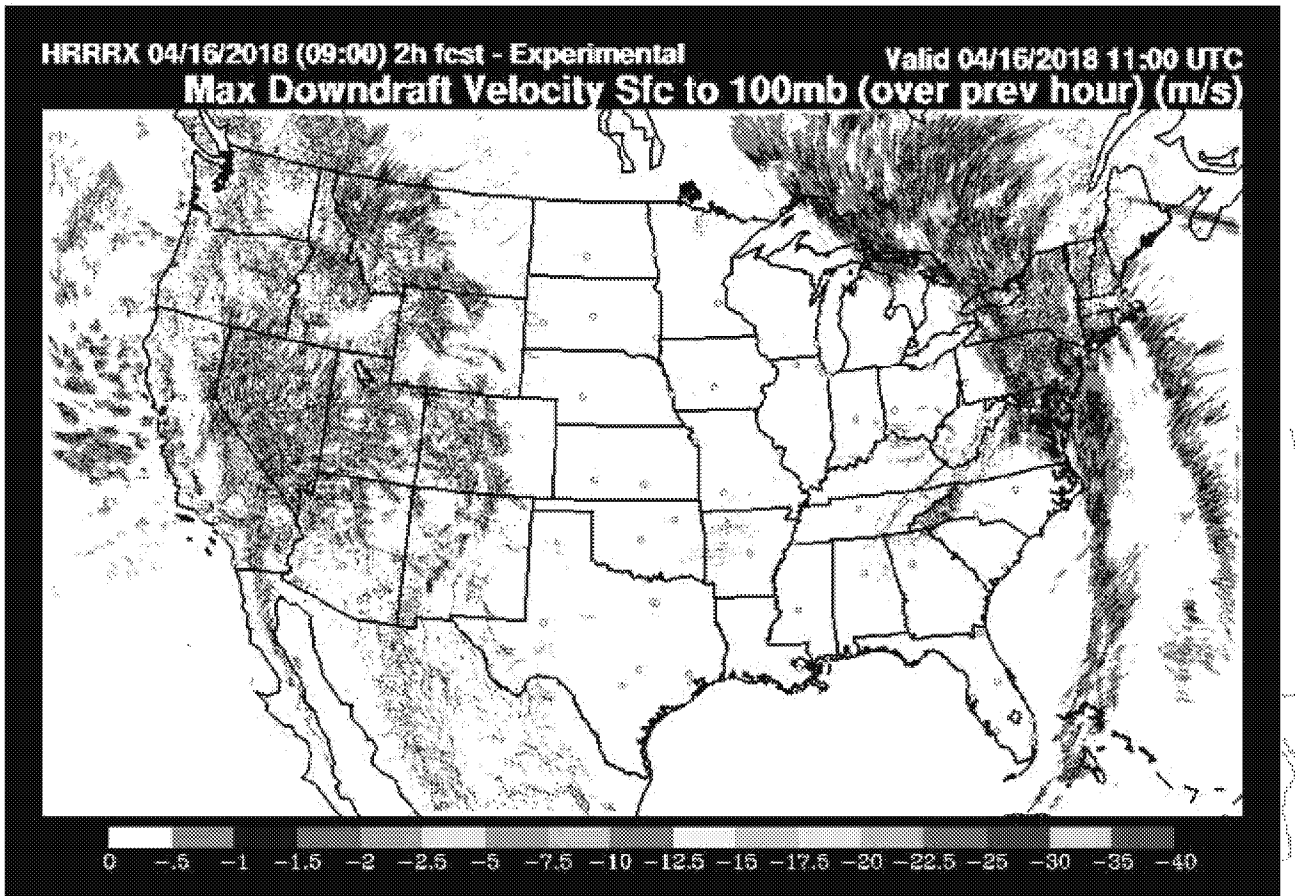
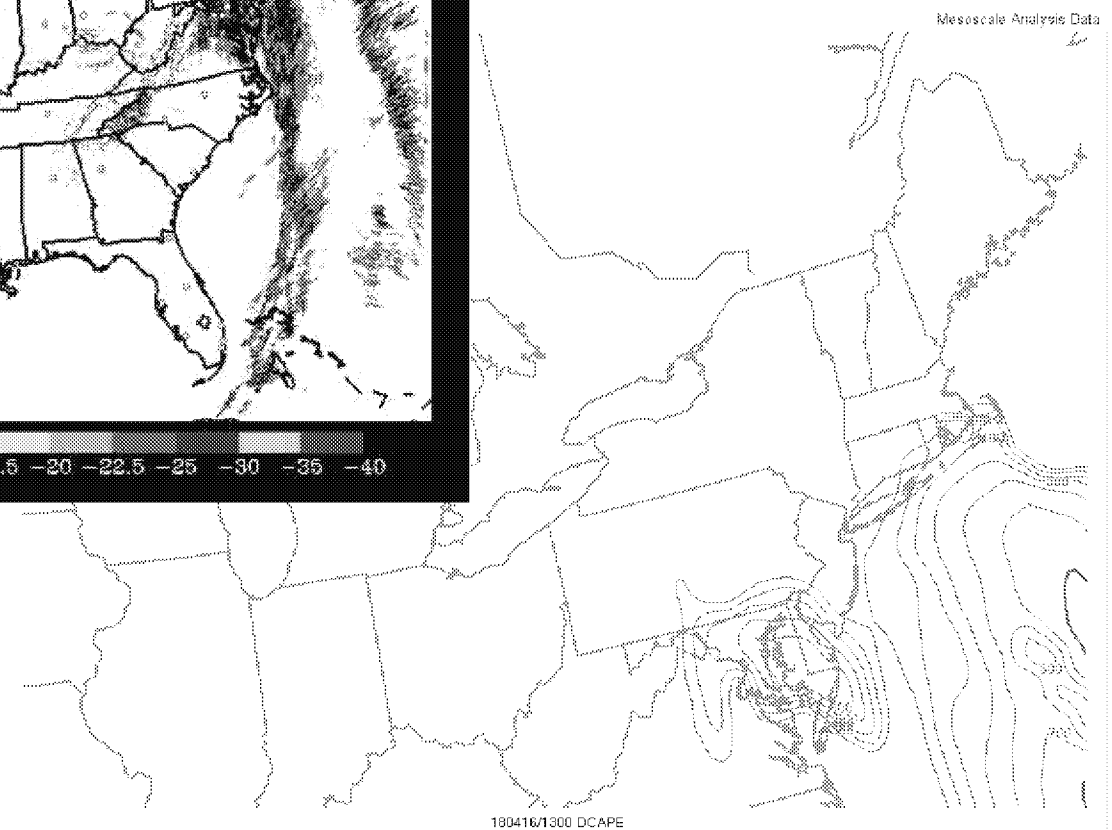
- ***Strong*** dynamic forcing fostered rapid convective growth: Strong Jet, moist warm sector
- Stratospheric ozone already present at lower altitudes
- Convectively induced surface ozone increases and/or
- Low-level jet acted a “rear inflow jet” as typical in bow-echoes

Role of Dynamic and Convective Processes

HRRR





Summary

- A significant hybrid stratospheric ozone intrusion event occurred in Maryland on the morning of Monday, April 16, 2018
- Ozone increased with a convective gust front by 35-55ppb in a matter of minutes
- The dynamics (vertical motions) of a quickly developing low level jet coupled with convective over-turning brought ozone from an inferred stratospheric "dry slot" to the surface