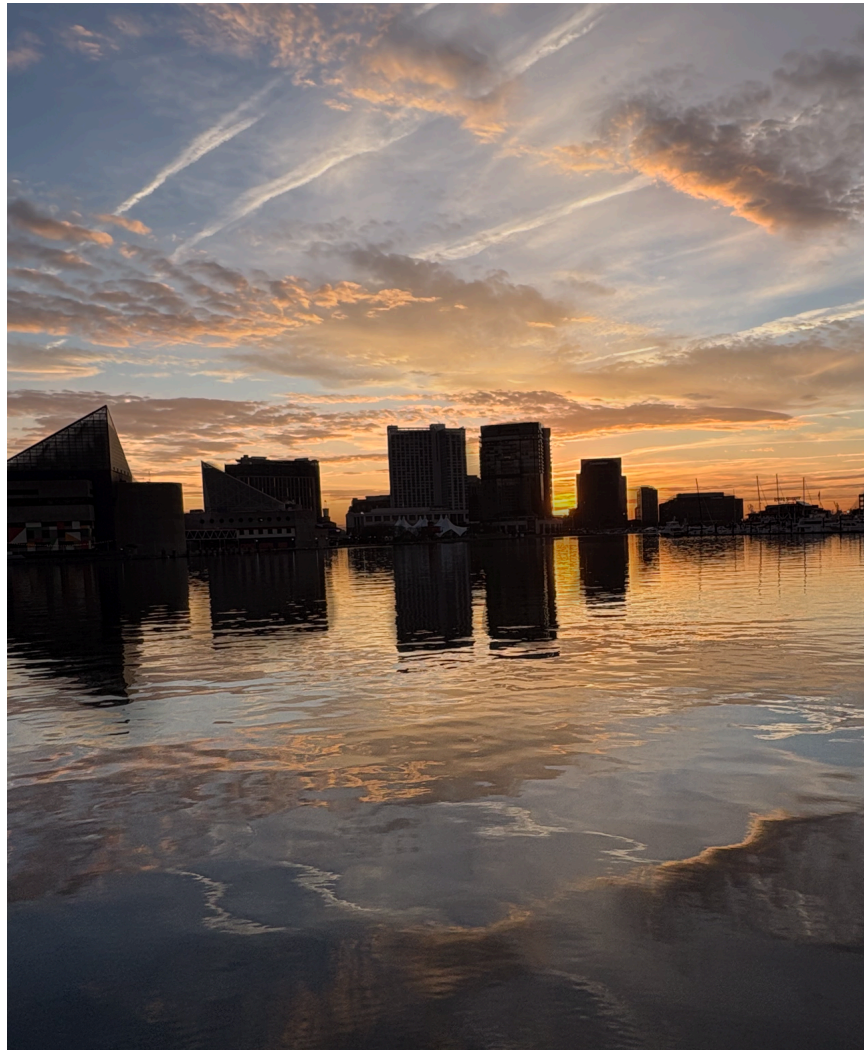


Alto cumulus and Contrails Above Baltimore's Inner Harbor

12/5/2025 - Clouds Second

Avery Calloway

Flow Visualization - 002



Introduction

The primary purpose of this image is to capture the layered cloud structures and stable contrails illuminated during sunrise over Baltimore's Inner Harbor. I wanted to capture the reflections of the clouds, especially the closest altocumulus since you can match up that reflection very well. I also thought that the perfect reflections of all the buildings added visual interest by splitting the image in half. The orange morning light illuminating the undersides of the clouds really highlighted the depth and layering present in the atmosphere.

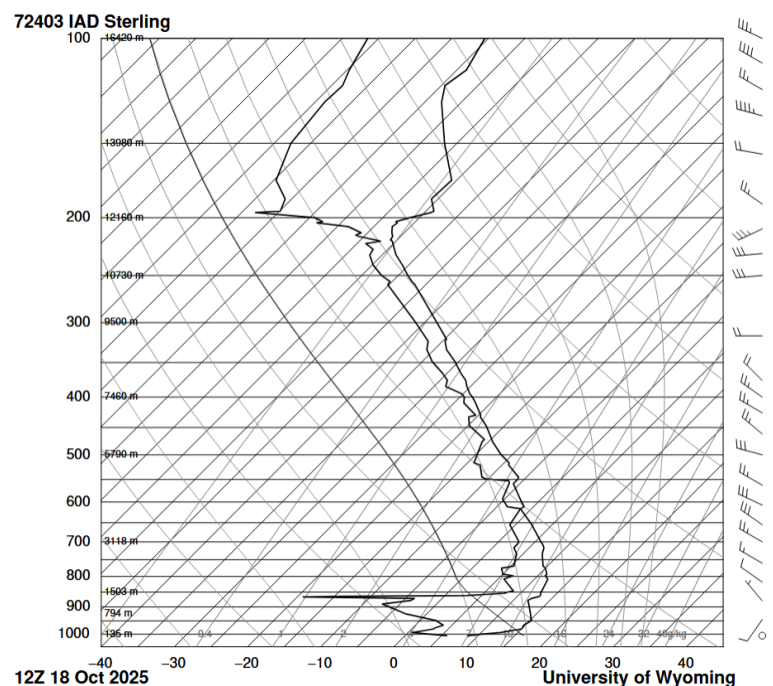
Image Circumstances

I took this photo at Baltimore's Inner Harbor in Maryland at approximately $39^{\circ}17'06.6''\text{N}$ $76^{\circ}36'42.9''\text{W}$. I was facing east toward the sunrise and the camera was approximately level with the horizon. The photograph was taken on October 18, 2025, at 7:25am when the sun was just at or below the horizon, illuminating the underside of the clouds.

Cloud Identification and Meteorological Analysis

The image shows primarily two distinct cloud layers. The upper layer consists of contrails left behind from the planes arriving and departing Baltimore Washington International. These are located around 200-300 mb according to the Skew-T diagram, which corresponds to approximately 30,000-40,000 feet above sea level, which is consistent with cruising altitude for airplanes. The contrails held their shape for an unusually long time, but this is most likely due to a high moisture content and/or very stable atmosphere.

The lower layer is made up of altocumulus clouds, characterized by the cottonball-esque appearance. The Skew-T diagram shows a moist layer around 500-600 mb, which corresponds to approximately 16,000-20,000 feet above sea level. Combined with the stable layer around this altitude it is likely that there's a stratified cloud deck rather than vertical development. The parallel banding pattern suggests organized atmospheric waves or wind shear at this altitude, and this is backed up by the consistent wind directions shown on the Skew-T.



The conditions leading to these clouds most likely involve the overnight cooling that occurs before sunrise. During the night, falling temperatures create a stable atmosphere with temperature inversions that suppress vertical motion. Since the image was taken early in the morning, the lack of surface heating maintains the atmospheric stability and prevents the vertical development that would occur later in the day as the sun warms the surface.

Photographic Technique

The photograph was captured using an iPhone 16 wide angle camera

- 3024 x 4032 px original
- 2538 x 3071 px cropped
- f/2.2, 1/569 s, ISO 40, ~75° FOV
- 21mm equivalent focal length
- Editing: slight boost to orange tone vibrancy, crop, contrast boost, exposure lowered on buildings only

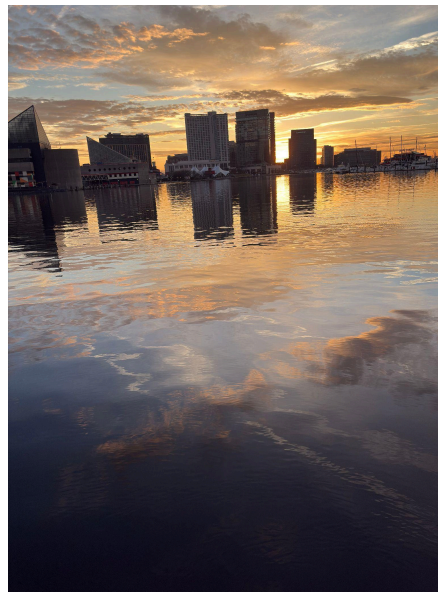


Figure 1: Original Image

Image Analysis

Overall I'm really proud of this photo. It captures the reflections from the clouds very well, which was what I was focusing on. The edge of the harbor and the buildings create a very stark break across the center of the image, which draws your eyes up to the clouds then down to the reflections. The way that the contrails and clouds are almost exactly perpendicular to each other adds to the geometric feel of the image, which is also increased by the Aquarium building being an odd triangular shape.

References

1. Ahrens, C. D., & Henson, R. (2021). *Meteorology Today: An Introduction to Weather, Climate, and the Environment* (12th ed.). Cengage Learning.
2. Houze, R. A. (2014). *Cloud Dynamics* (2nd ed.). Academic Press.
3. World Meteorological Organization. (2017). *International Cloud Atlas*. Retrieved from <https://cloudatlas.wmo.int/>