

**ATS/CIRA Seminar**

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**The Science of the Night—  
Shedding Light on the Nocturnal Environment  
with the VIIRS Day/Night Band**

**Hosted by Peter Jan van Leeuwen**

**3 p.m. Friday, April 9**

**via Microsoft Teams**

Daytime imagery of reflected sunlight in the visible-light (VIS) portion of the electromagnetic spectrum has been a staple of Earth-viewing radiometers since the advent of environmental satellites, first launched in the early 1960s. At night, and in the absence of sunlight, these traditional radiometers measure only the infrared (IR) emissions of Earth and its atmosphere. While IR observations offer many important and unique capabilities both day and night, they also face inherent limitations to detecting and describing the properties of many environmental parameters, including clouds, aerosols and the surface. These challenges have, in turn, limited our ability to improve our understanding and prediction of weather and climate processes in which these diurnally-varying parameters play important roles. Without the full complement of VIS and IR, the night can be a ‘scary’ place for research and operations alike!

VIS information does in fact exist at night, originating from a diversity of natural (e.g., moonlight, fires, aurora and airglow) and artificial (e.g., cities, natural gas flares, and boat lights) sources. However, detection of these faint signals requires a refined technology compared to standard VIS sensors. Such measurements have existed on U.S. Department of Defense satellites, but only in a crude way. The Visible/Infrared Imaging Radiometer Suite (VIIRS) Day/Night Band (DNB), carried on the NOAA/NASA Suomi National Polar-orbiting Partnership (S-NPP) and NOAA’s Joint Polar Satellite System (JPSS) constellation over the past decade, offers the first detailed, calibrated, science-quality measurements of nocturnal VIS. The DNB provides new awareness of and perspective on major elements of the climate system (cryosphere, lithosphere, hydrosphere, atmosphere, and biosphere) and, through its unique ability to sense artificial lighting, a looking-glass upon ourselves—including the current state and changes to infrastructure, energy consumption, human behaviors, and disaster impacts.

In this talk, we delve into the paradigm shift to nocturnal characterization brought by the VIIRS/DNB. Via striking examples of the night’s cornucopia of lights, we see how useful VIS-based information is indeed always available—even on the darkest, moonless nights. These novel measurements blaze an exciting new frontier of opportunities—The Science of the Night—that complements and augments existing research pathways and continues to yield scientific discoveries. Importantly, the DNB illuminates the diurnal cycle of the Earth/atmosphere system, offers a unique perspective on humans as part of the biosphere, and provides critical advances to nocturnal situational awareness for operational weather forecasters. The dark-adapted vision of our eyes in the sky helps us probe the shadows and recesses of current knowledge, overcome our traditional ‘fear’ of the dark, and see the night in an entirely new light!