Near-Constant Contrast (NCC)

Enhanced Day Night Band (DNB) visible imagery

Quick Guide

Why is the Near-Constant Contrast (NCC) Important?

The Near-Constant Contrast (NCC) is a derived product of the 0.7um Day/Night Band (DNB) that provides unique visible imagery at night. DNB detects a broad range of light intensities (8-orders of magnitude in radiance space) and is very sensitive to low levels of light, including reflected and emitted sources. The wide range of light intensities detected by DNB, makes it difficult to display imagery, without losing detail at either end of the radiance scale. NCC was developed to mitigate enhancement issues by using a model of the sun and moon to convert DNB radiance values into a pseudo reflectance- value.

Near-Constant Contrast from S-NPP VIIRS at 0524 UTC, 6 September 2017. Image of Hurricane Irma during the full moon phase of the lunar cycle.

Phase of lunar cycle	Reflected moonlight from clouds, snow, ice, and surfaces	Emitted light from cities, fishing boats, gas flares, lightning, aurora, and fires
New Moon	Lowest NCC values (very dim): illumination primarily by nightglow, cloud tops appear fuzzy	High NCC values (brighter): significantly brighter than surroundings
Full Moon	Highest NCC values (very bright): ability to see details in cloud top texture	High NCC values (bright): proportionally less bright than surroundings

Impact on Operations

Primary Application

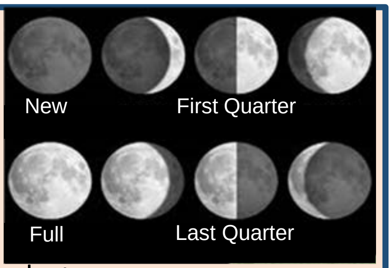
Nighttime "Visible" Imagery: Provides a view of low-level clouds and snow at night that are more challenging to detect with single channel infrared imagery.

Tropical Cyclones: Similar to the daytime visible counterpart, NCC is used in tropical cyclone center location and eye detection. This is important for weaker storms that tend to be less organized.

Emitted Light: City lights, gas flares, fire, lightning, and aurora show up clearly. Applications include monitoring wildfire perimeters and hot spots (new light source!), power outages (disappearance of light!), geolocation of regional features (i.e. prison facility outside town).

Limitations

Lunar Cycle: The illumination of clouds at night is a function of moon phase and elevation above the horizon. For 0130 local overpass, there is no moonlight from 2 days after the last quarter until 2 days after the first quarter lunar phase. During this time emitted lights will dominate the scene.



Terrain Effects: In high-elevation areas, emitted lights appear to shift from one swath to another, due to different satellite viewing angles.

Infrequent: This product is limited to low-earth orbiting satellites which provide global coverage twice per day.

Auroras: Auroras can be very bright and cover large areas, obscuring surface features.

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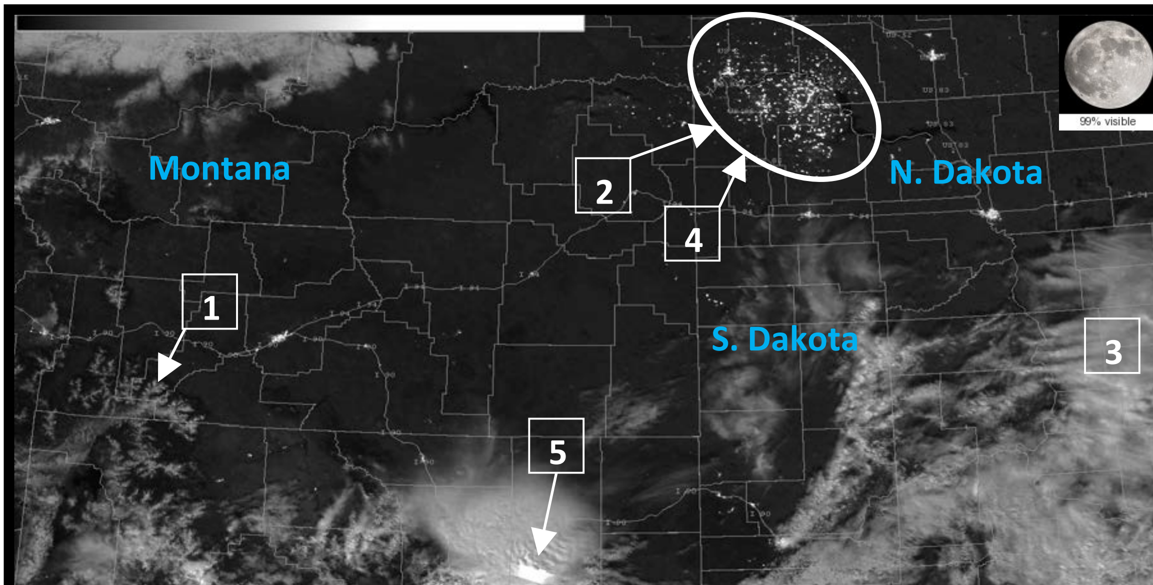
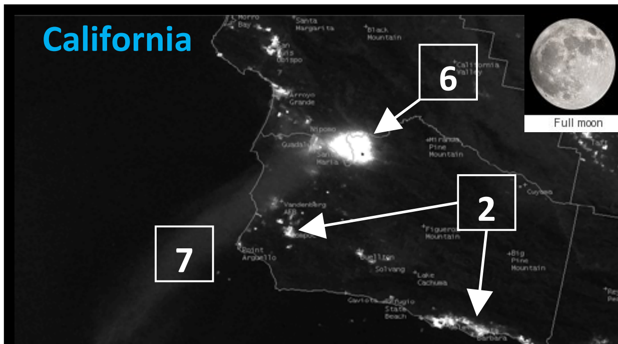
Interpretation

1. **Snow** *(swath or dendritic pattern)*
2. **City and Town Lights** *(individual pixels or clusters)*
3. **Cloud Cover** *(like daytime visible)*
4. **Gas Flares** *(individual pixels or clusters)*
5. **Lightning** *(bright streak within cloud)*
6. **Fires** *(bright)*
7. **Smoke** *(diffuse plume from a point or area source)*

Note: relative brightness varies by season, moon phase and moon elevation above horizon



Near-Constant Contrast from S-NPP VIIRS at 0923 UTC, 6 October 2017. Note, a combination of City/Town lights and gas flares are seen within the white ellipse.



NCC from S-NPP VIIRS at 0909 UTC, 8 July 2017.

Resources

CIRA VISIT Training Session

Introduction to NCC DNB VIIRS imagery in AWIPS

CIRA/RAMMB

VIIRS Imagery and Visualization Team Blog

Hyperlinks not available when viewing material in AIR Tool

NCC imagery enhancement: The NCC color table scale in AWIPS can be customized to bring out atmospheric features in the satellite imagery. Two imagery enhancements of fog/ low stratus on 12 May 2018 at 0935 UTC are seen over southern California during the new moon phase of the lunar cycle. Notice how the NCC 0-0.5 scale brightens the ambient cloud cover, but also increases the saturation of city lights in comparison to the default NCC 0-1 scale. Different scales will bring out certain features more than others.