

# **Stratospheric Injection of Massive Smoke Plume from Canadian Boreal Fires in 2017 as seen by DSCOVR-EPIC, OMPS-LP and CALIOP Observations**

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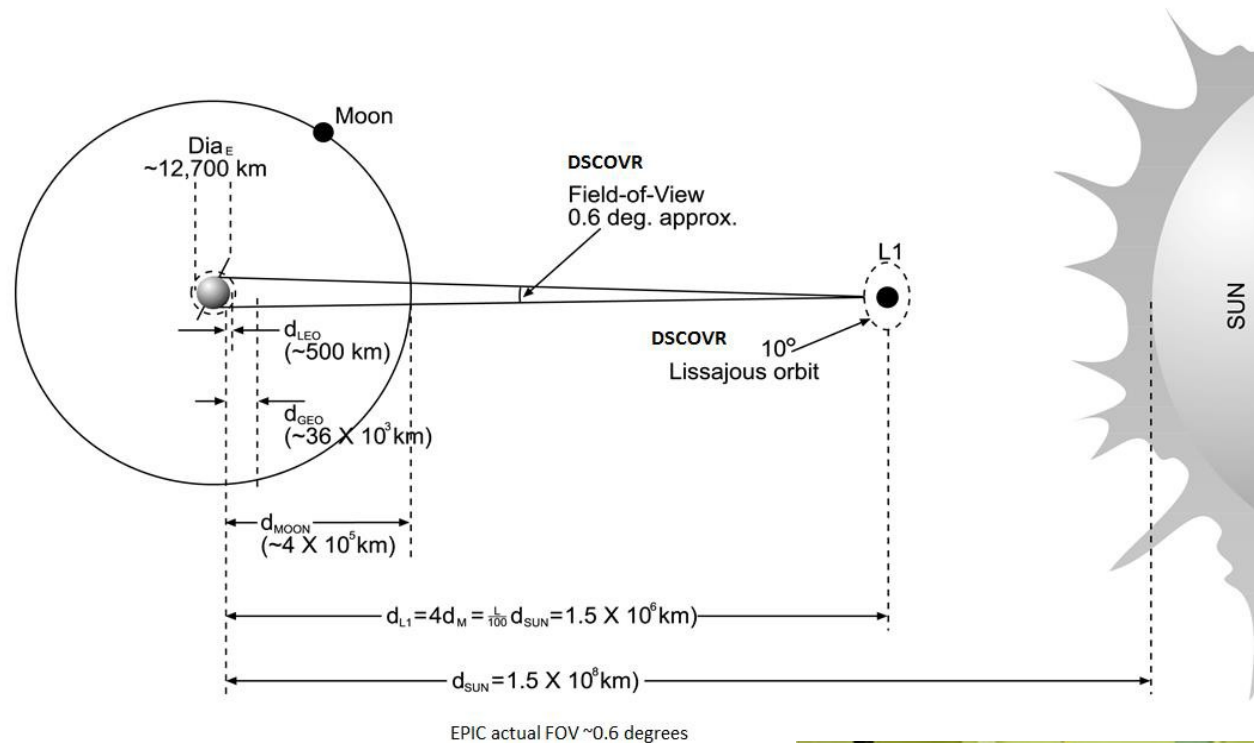
<sup>2</sup> USRA-GESTAR, Greenbelt, MD, 20771

***Chapman Conference on Stratospheric Aerosols***

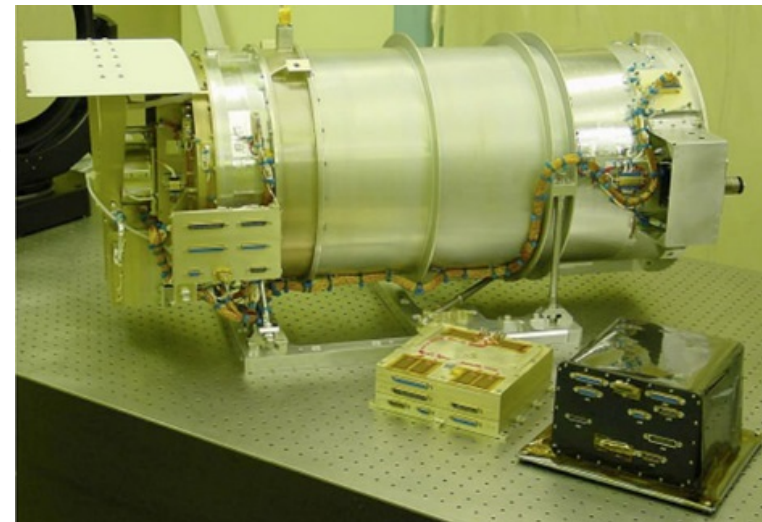
Tenerife, Spain

March 18-23, 2018

# Earth Panchromatic Imaging Camera – Deep Space Climate Observatory



- EPIC is one of three sensors on the DSCOVR spacecraft.
- Launched on Feb. 11 2015
- Reached L1 point on June 8, 2015
- Observes the Sun-lit face of the Earth from sunrise to sunset every 66 minutes.
- Spatial Resolution  $\sim 18 \text{ km}$



## EPIC Channels and Products

$\lambda$ (nm)	FWHM (nm)	Nominal Product
$317.5 \pm 0.1$	$1 \pm 0.2$	<i>Ozone</i>
$325 \pm 0.1$	$2 \pm 0.2$	<i>Ozone</i>
$340 \pm 0.3$	$3 \pm 0.6$	<i>Ozone, Aerosols, Clouds</i>
$388 \pm 0.3$	$3 \pm 0.6$	<i>Aerosols, Clouds</i>
$443 \pm 1$	$3 \pm 0.6$	<i>Aerosols</i>
$551 \pm 1$	$3 \pm 0.6$	<i>Aerosols, Vegetation</i>
$680 \pm 0.2$	$2 \pm 0.4$	<i>Aerosol, Vegetation, Clouds, O<sub>2</sub> B-Band Reference</i>
$687.75 \pm 0.2$	$0.8 \pm 0.2$	<i>O<sub>2</sub> B-Band Cloud Height</i>
$764.0 \pm 0.2$	$1 \pm 0.2$	<i>O<sub>2</sub> A-Band Cloud Height, Aerosol Height</i>
$779.5 \pm 0.3$	$2 \pm 0.4$	<i>O<sub>2</sub> A-Band Reference, Vegetation</i>

## EPIC near UV Aerosol Products

- UV Aerosol Index
- Aerosol Optical Depth (388 nm)
- Single Scattering Albedo (388 nm)

$$UVAI = -100 \left\{ \log_{10} \left[ \frac{I_{340}^{obs}}{I_{388}^{obs}} \right] - \log_{10} \left[ \frac{I_{340}^{cal}}{I_{388}^{cal}} \right] \right\}$$

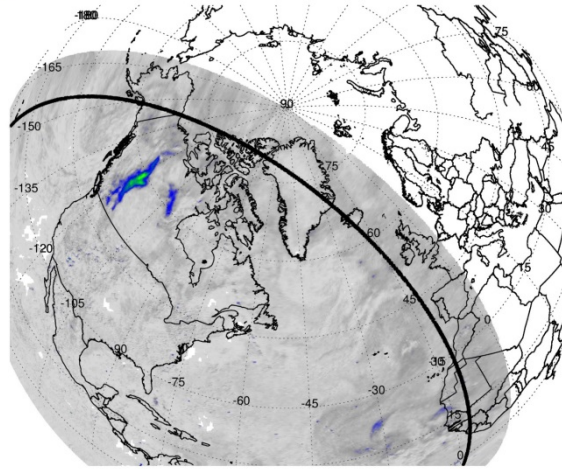
Difference between observed and calculated UV Spectral Contrast

- UVAI is sensitive to AOD, aerosol layer height, Aerosol Absorption Exponent
- UVAI typical values vary from -1 (non-absorbing aerosols) to about 6 (large AOD tropospheric smoke and dust layers)
- Double-digit UVAI values are generally associated with high altitude absorbing aerosol layers (volcanic ash and Carbonaceous particles)



# Pyro-Cb Injection Timeline

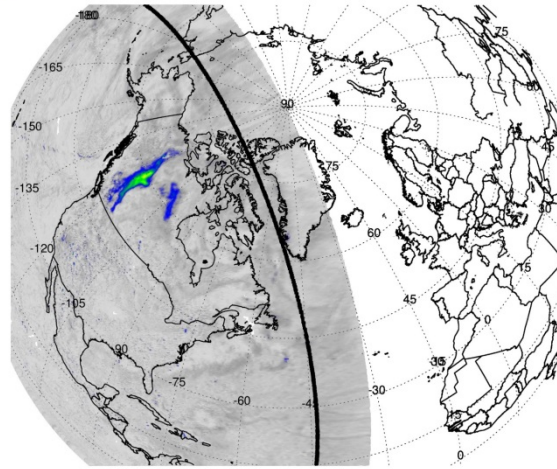
NASA Aug 12 17-17-12 UTZ



DSCOVR-EPIC UV Aerosol Index



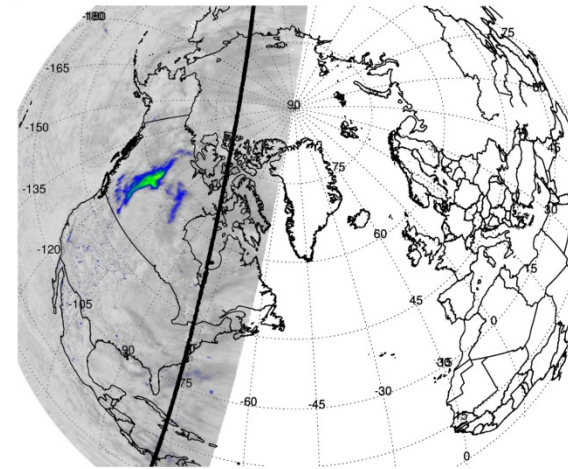
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DSCOVR-EPIC UV Aerosol Index



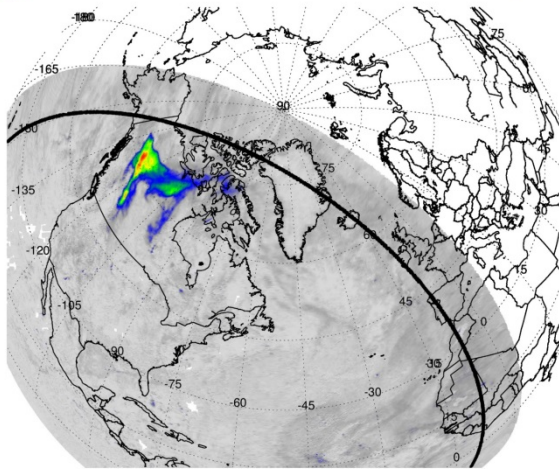
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DSCOVR-EPIC UV Aerosol Index



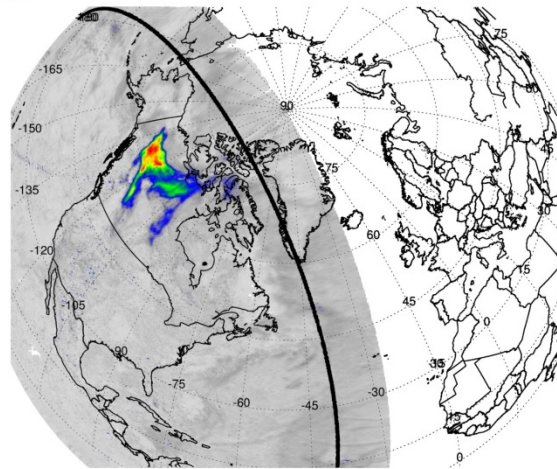
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DSCOVR-EPIC UV Aerosol Index



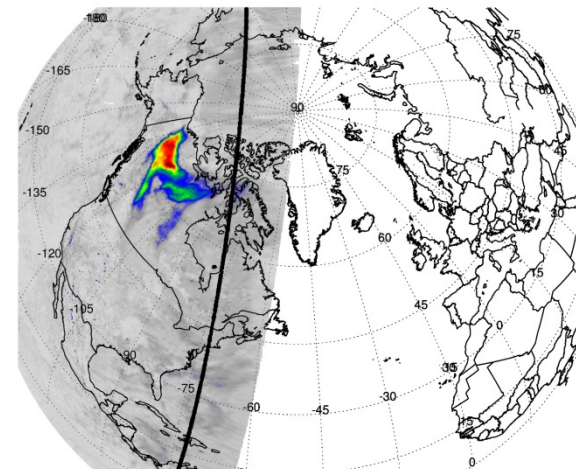
NASA Aug 13 19-09-25 UTZ



DSCOVR-EPIC UV Aerosol Index



NASA Aug 13 21-20-21 UTZ



DSCOVR-EPIC UV Aerosol Index

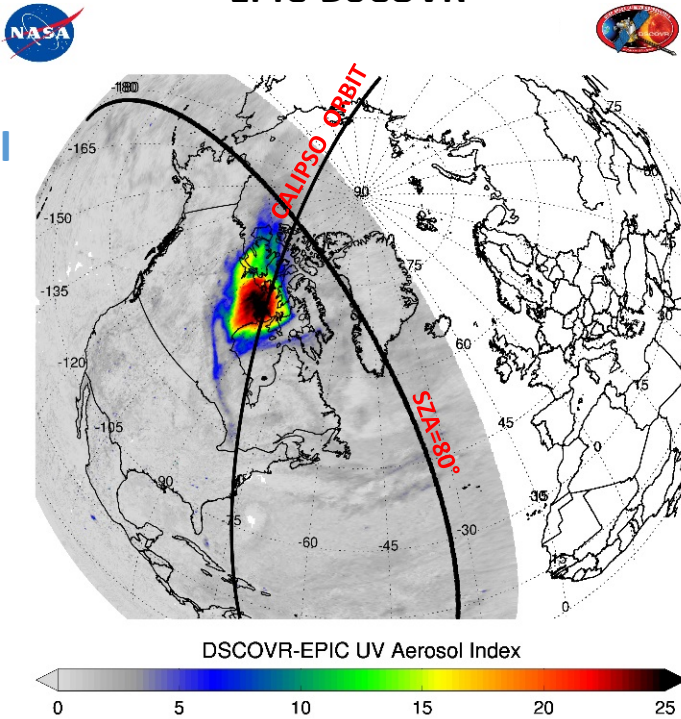




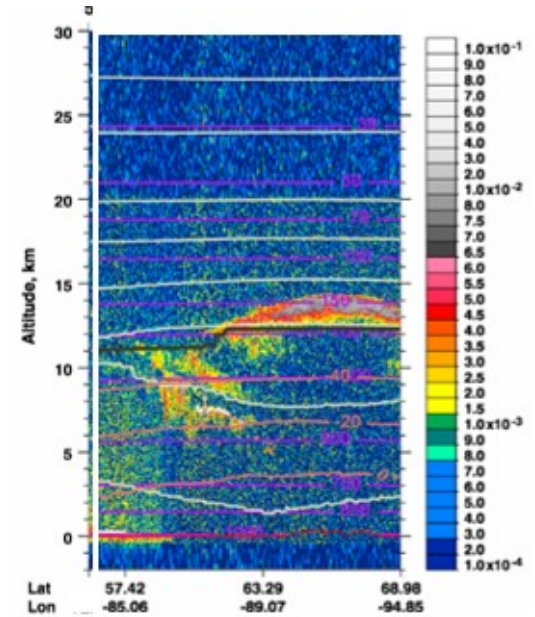
# Multi-sensor view of the British Columbia Pyro-Cb on August 15, 2017

EPIC-DSCOVER

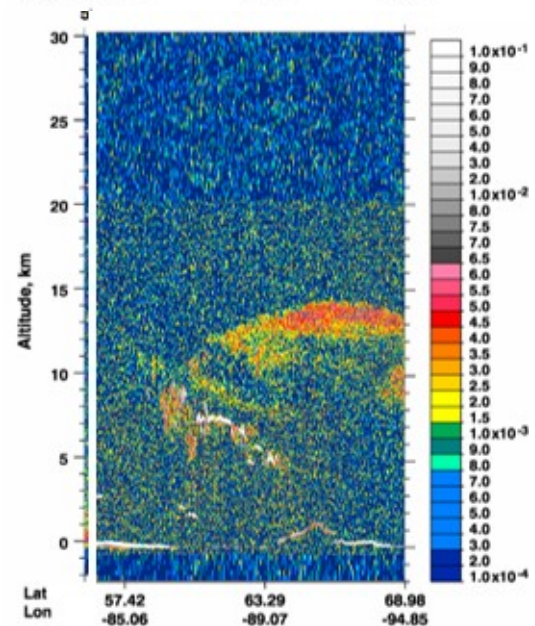
UVAI



CALIPOP Attenuated Backscatter

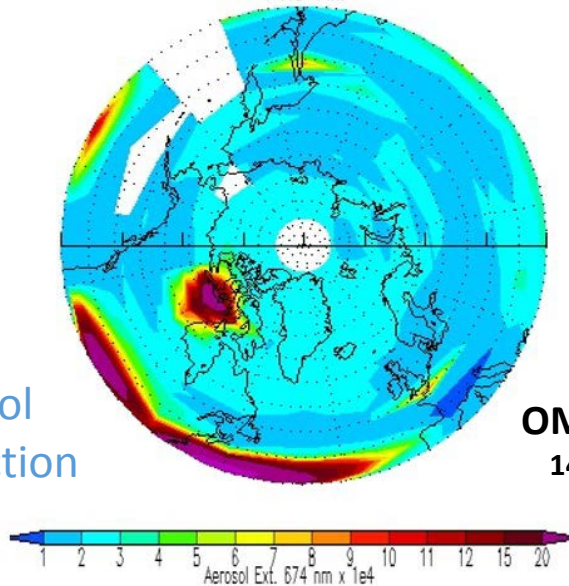


532 nm



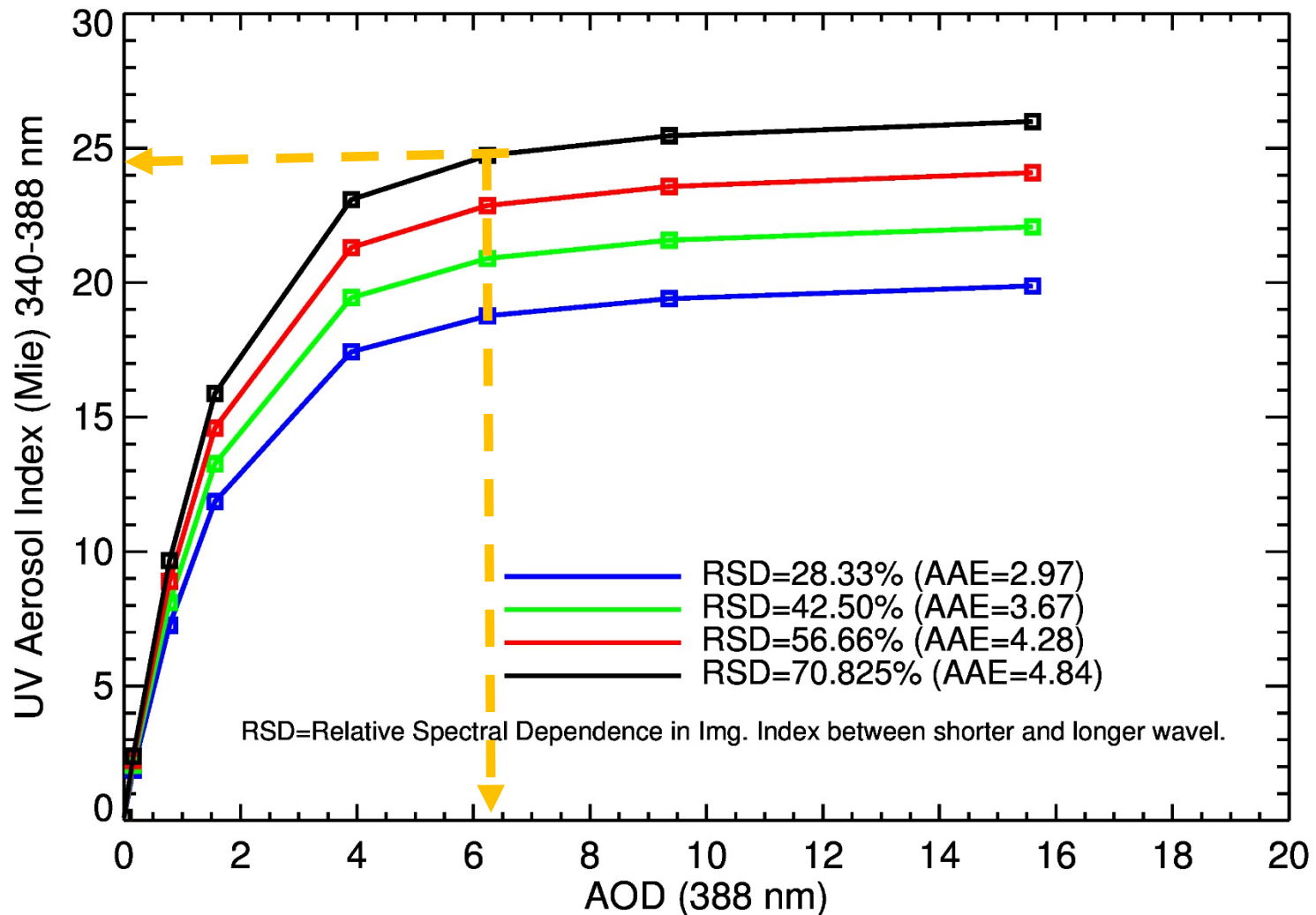
1064 nm

Aerosol  
Extinction



OMPS-LP  
14.5 km

## Interpreting the UV Aerosol Index

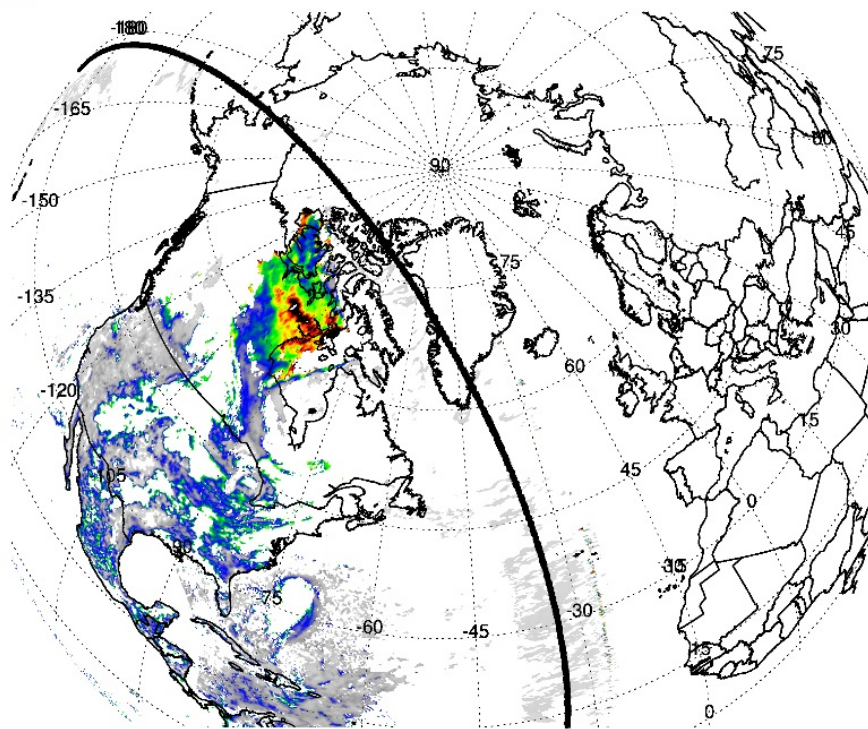


Relationship between UVAI, AOD and AAE for 15 km aerosol layer height

# EPIC-Retrieved AOD and SSA (August 15, 2017)



EPIC-DSCOVER\_L2-EPICAERUV\_20170815184121



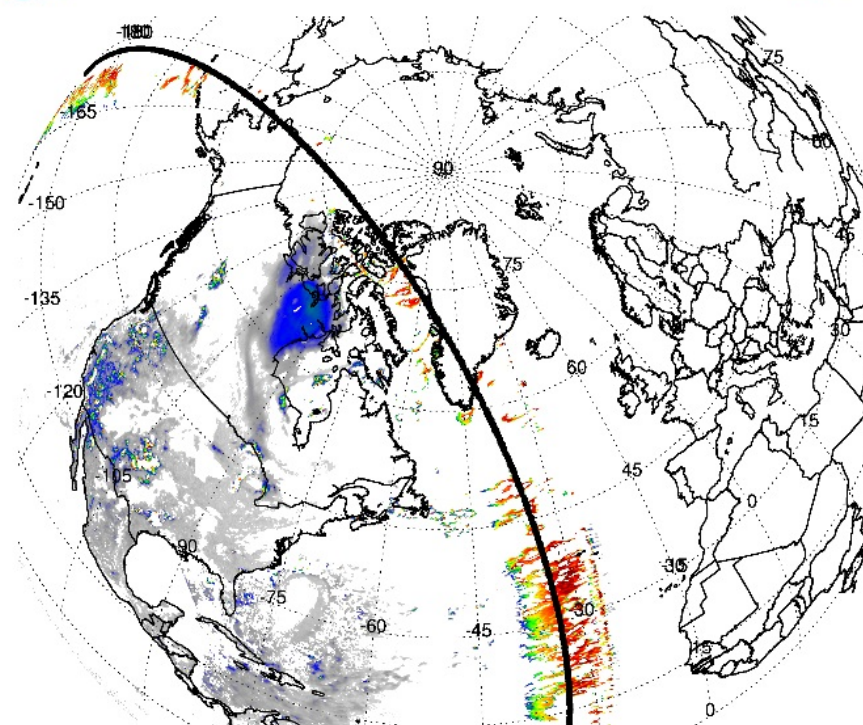
DSCOVER-EPIC AOD (388 nm)



AOD varies from 2 to 6 at 388 nm  
( 1.5 to 5 at 500nm)



EPIC-DSCOVER\_L2-EPICAERUV\_20170815184121



DSCOVER-EPIC SSA (388 nm)



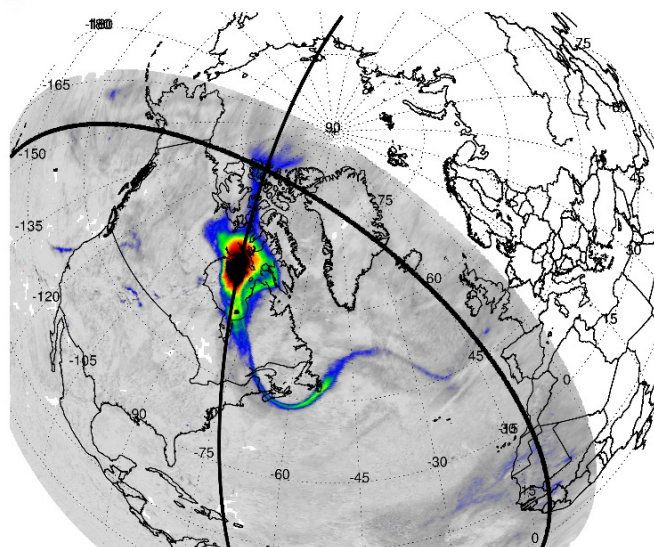
SSA values between 0.91 and 0.95 (388nm)  
0.88 and 0.93 (500 nm)



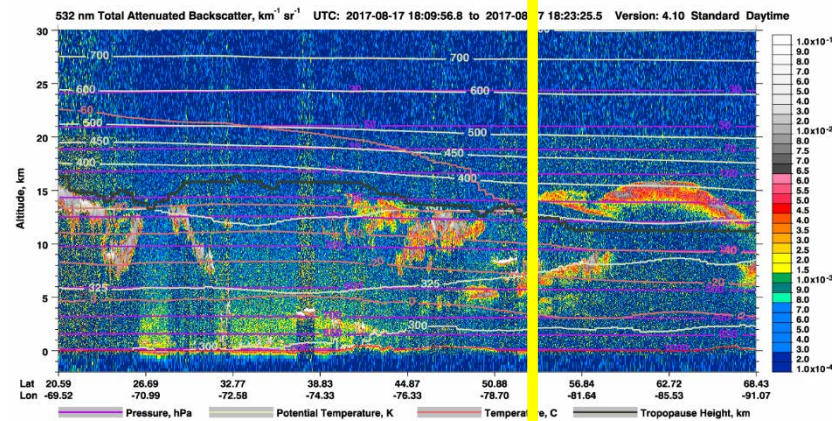
# Multi-sensor view of the British Columbia Pyro-Cb on August 17, 2017



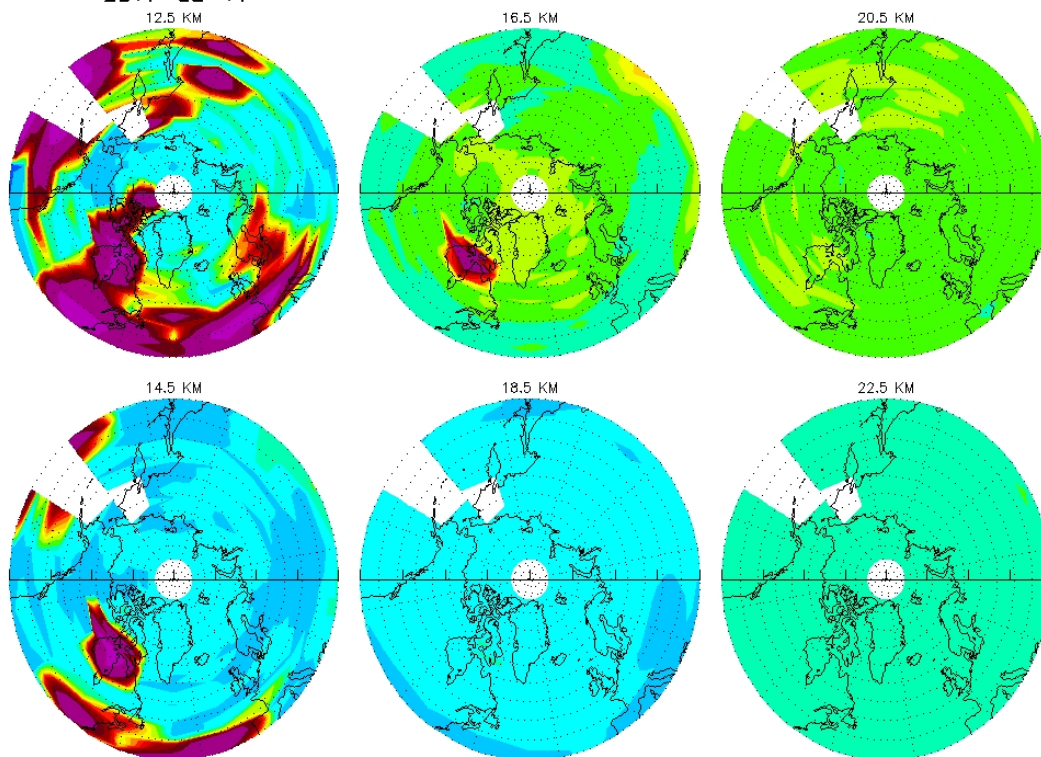
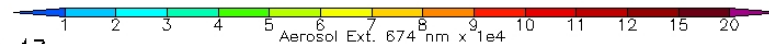
EPIC-DSCOVR\_L2-EPICAERUV-20170817170750



DSCOVR-EPIC UV Aerosol Index



2017-08-17

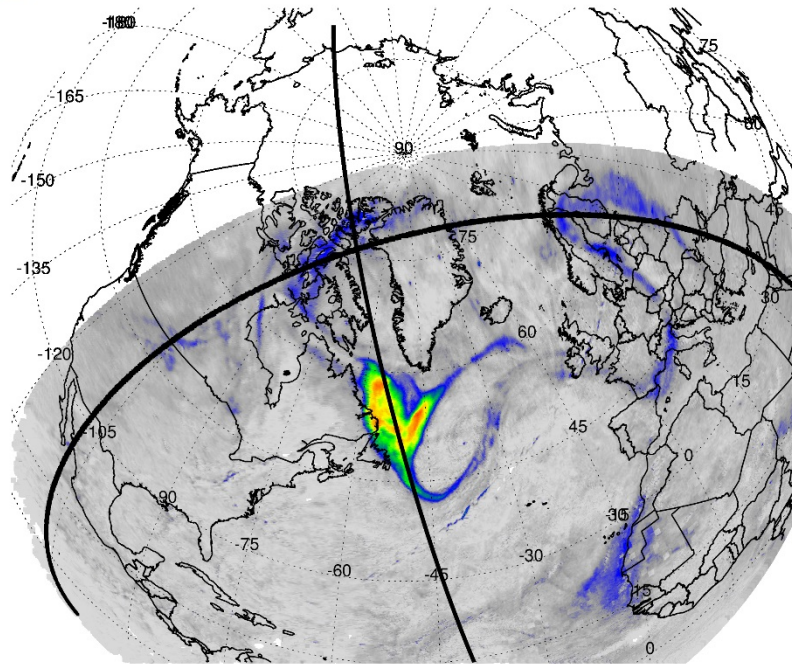




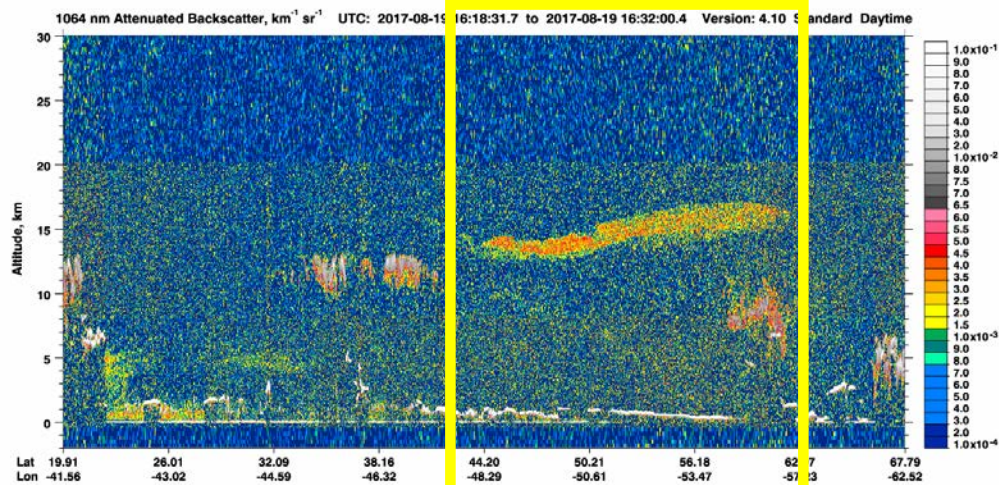
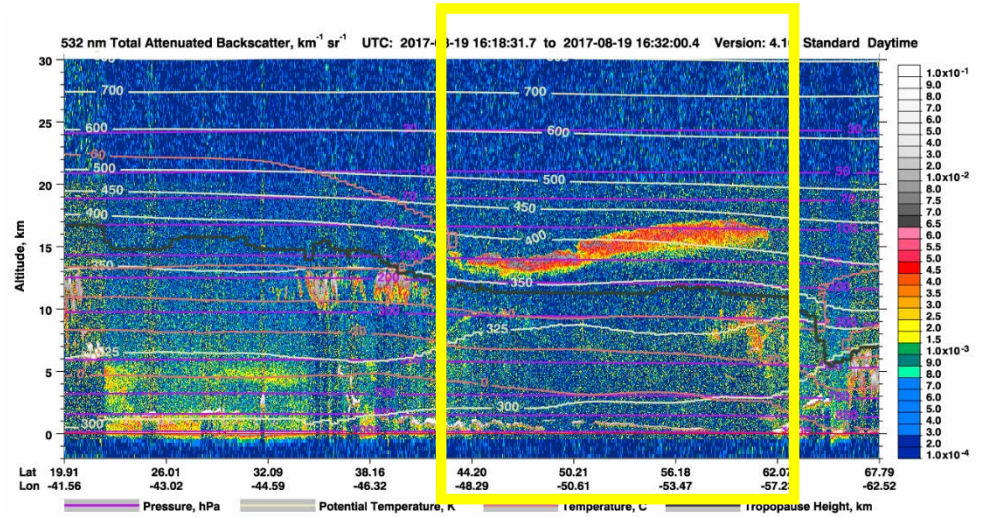
# EPIC and CALIOP view on August 19, 2017



EPIC-DSCOVRL2-EPICAERUV-20170819140048



DSCOVR-EPIC UV Aerosol Index

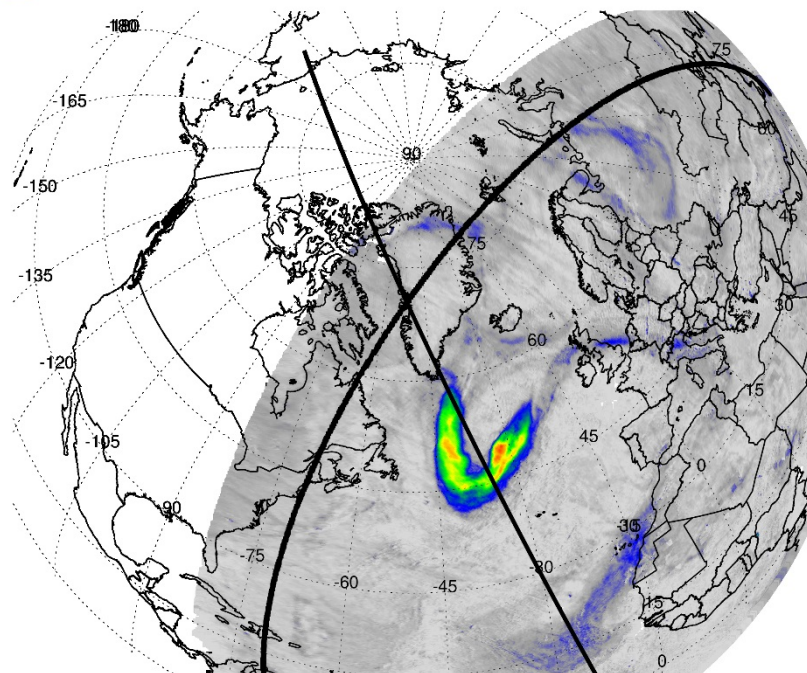




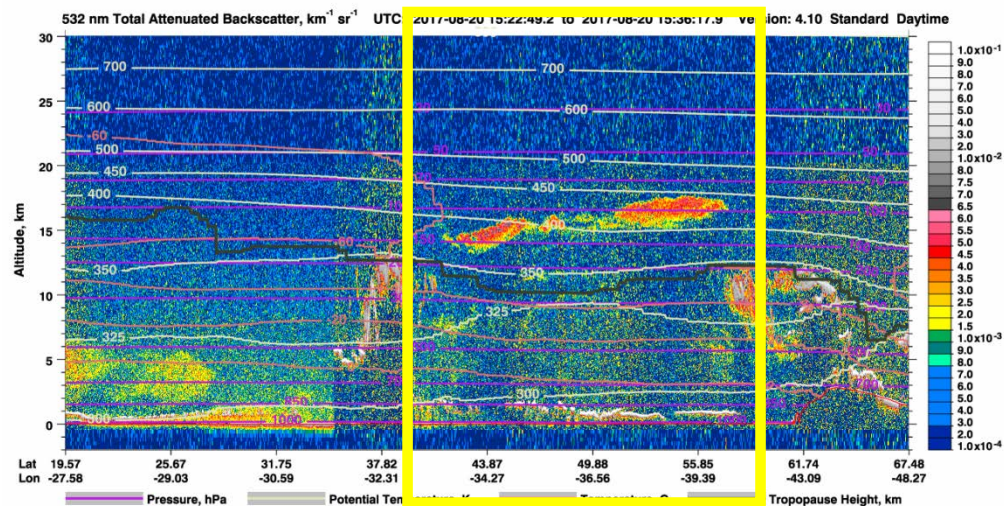
# August 20, 2017



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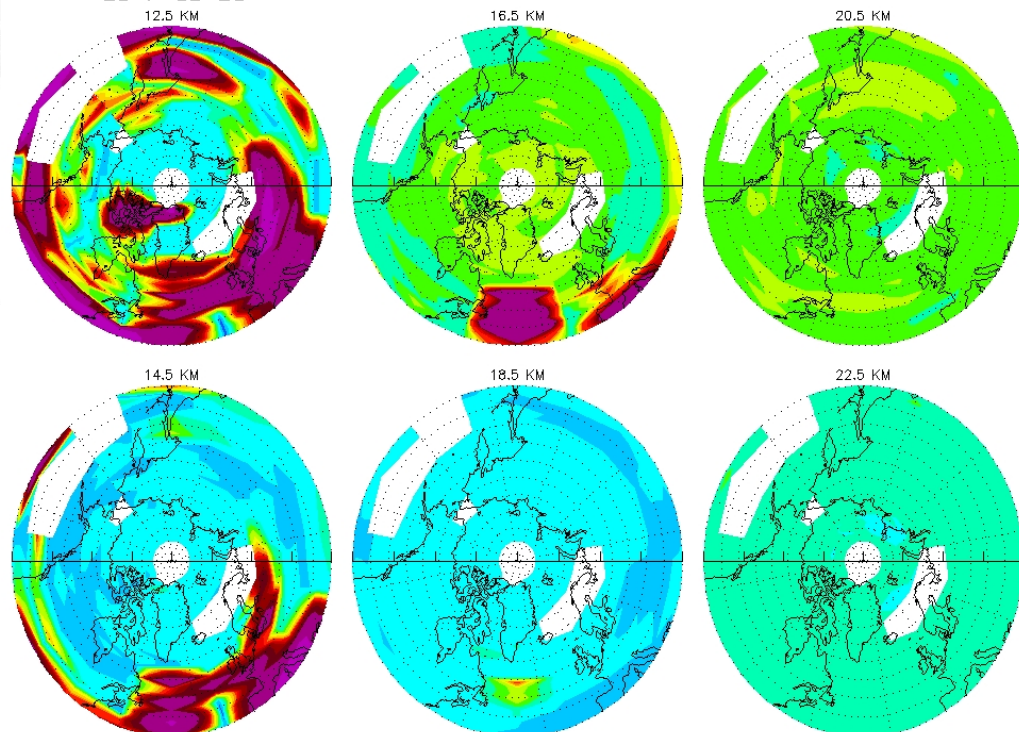


DSCOVR-EPIC UV Aerosol Index



2017-08-20

Aerosol Ext. 574 nm x 1e4

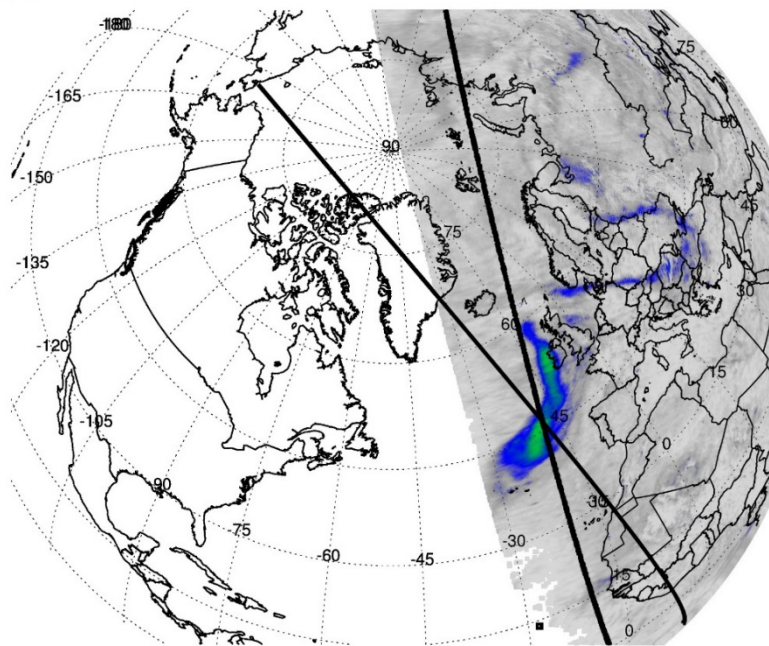




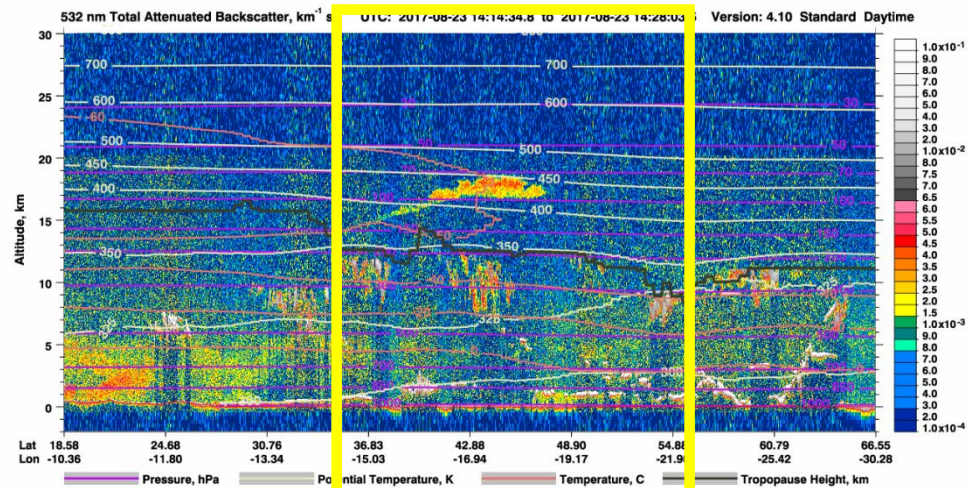
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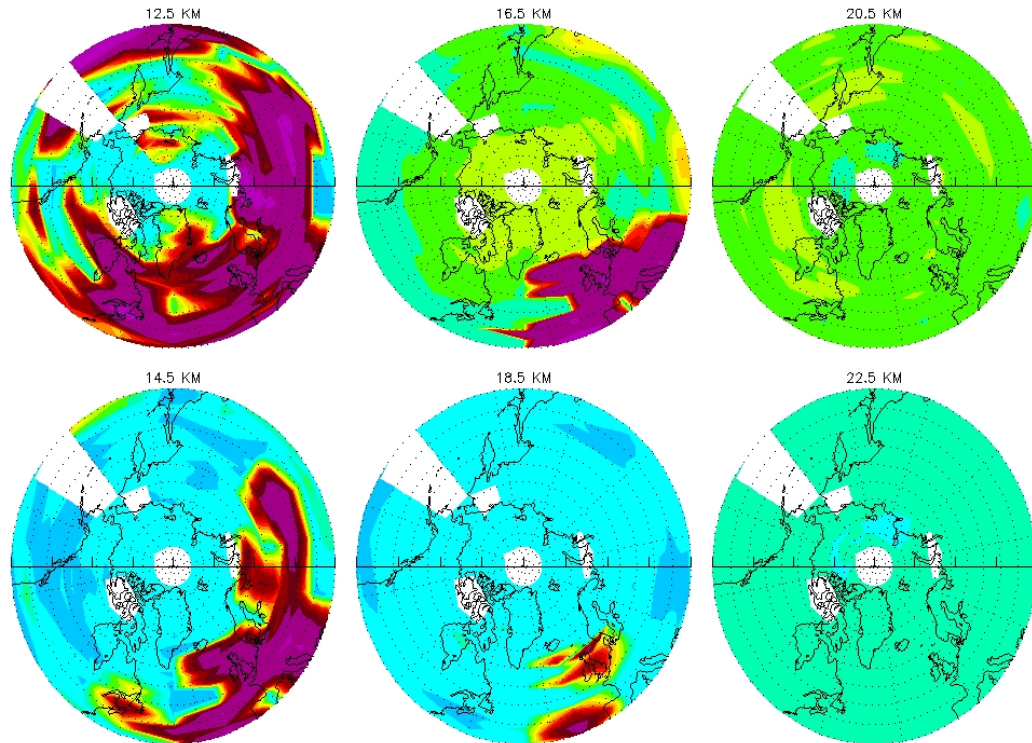
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DSCOV-EPIC UV Aerosol Index

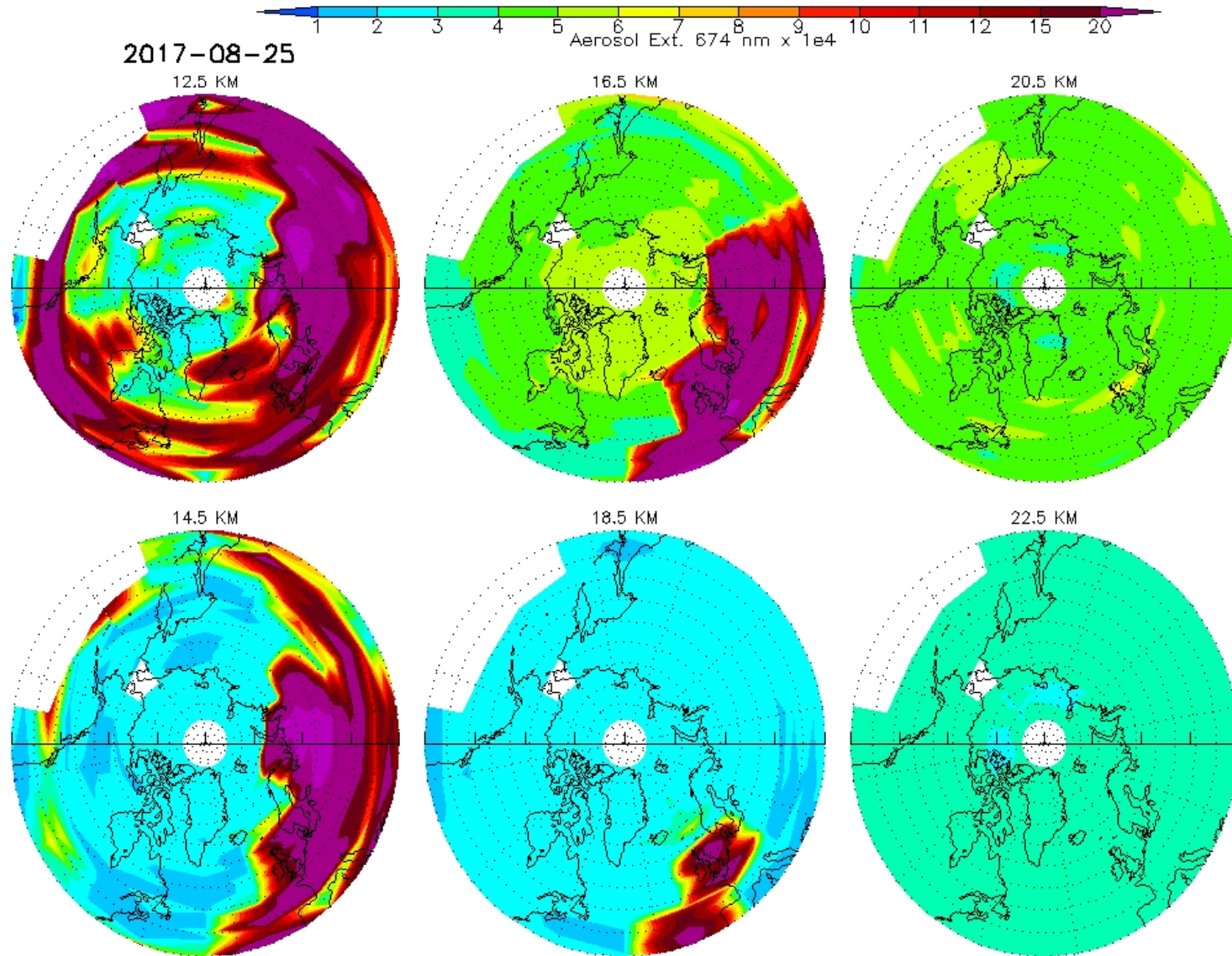


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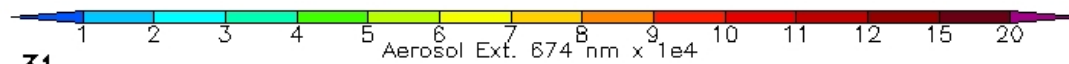




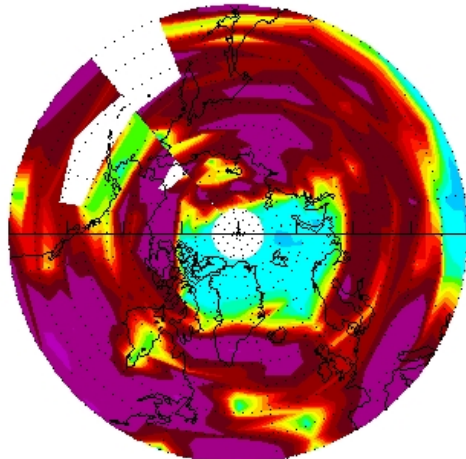
# Temporal Evolution of stratospheric carbonaceous aerosol layer as seen by OMPS\_LP



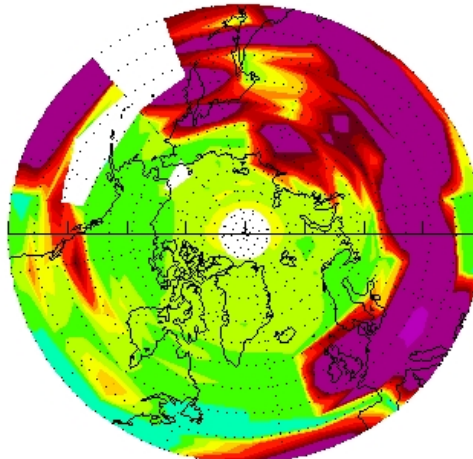
2017-08-31



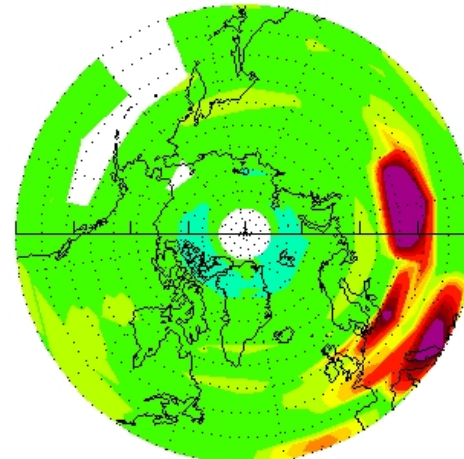
12.5 KM



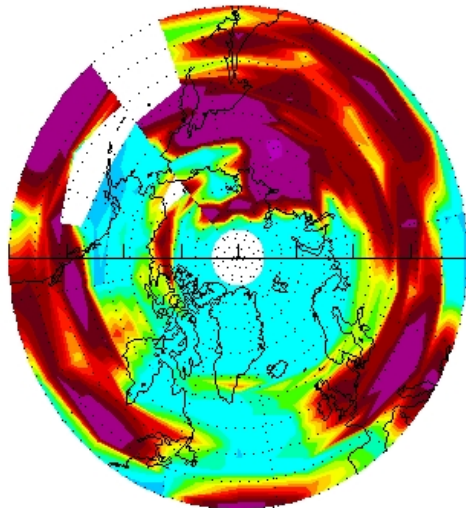
16.5 KM



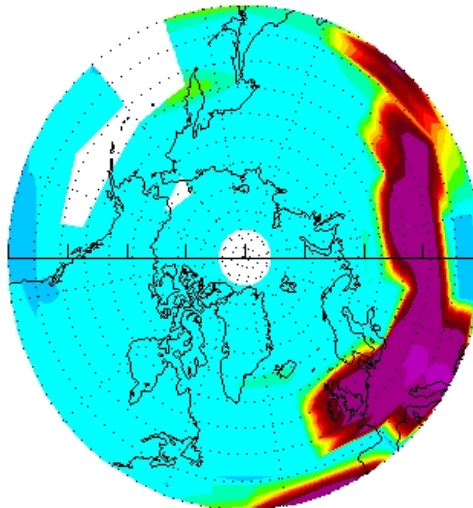
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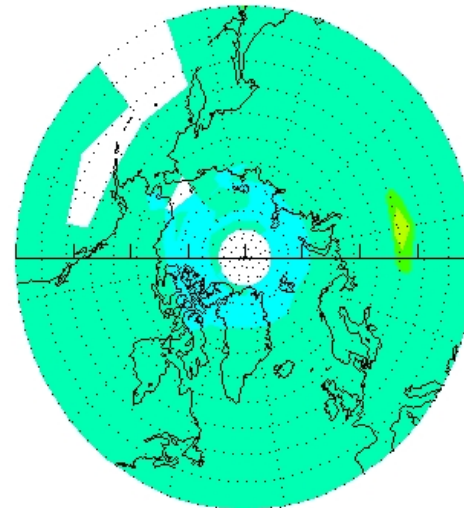
14.5 KM



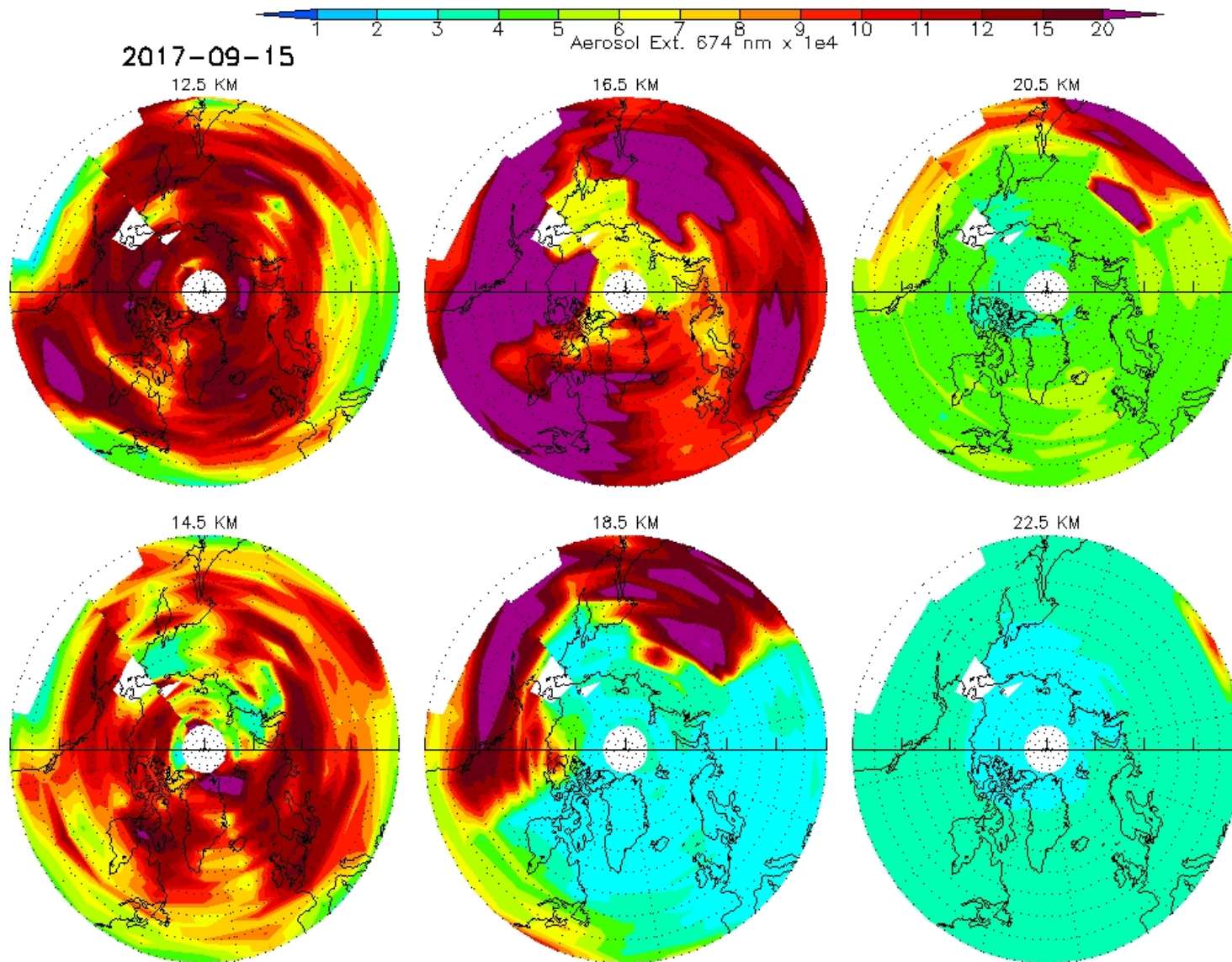
18.5 KM



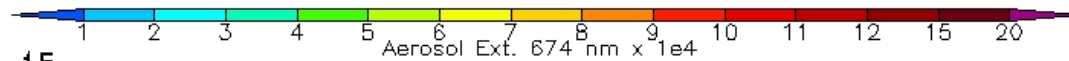
22.5 KM



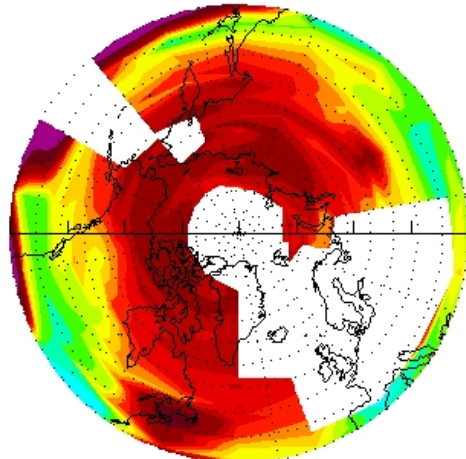




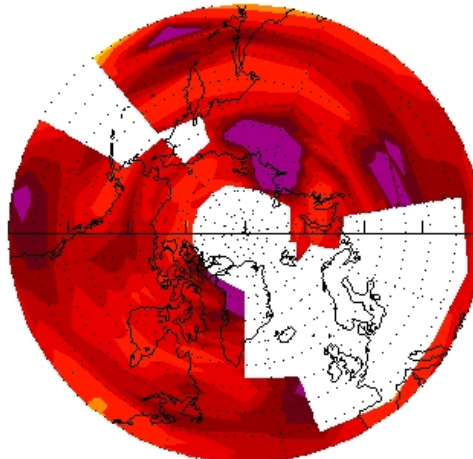
2017-10-15



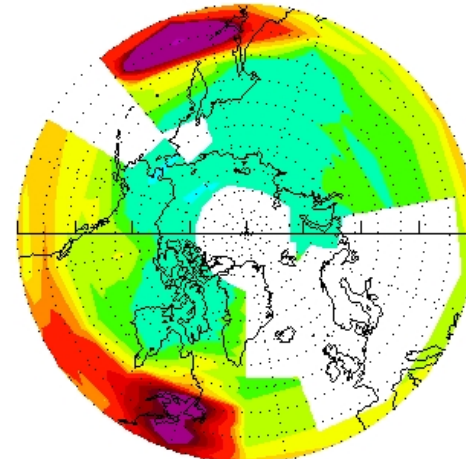
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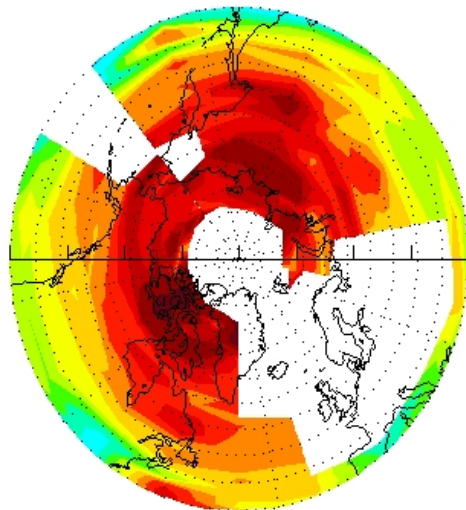
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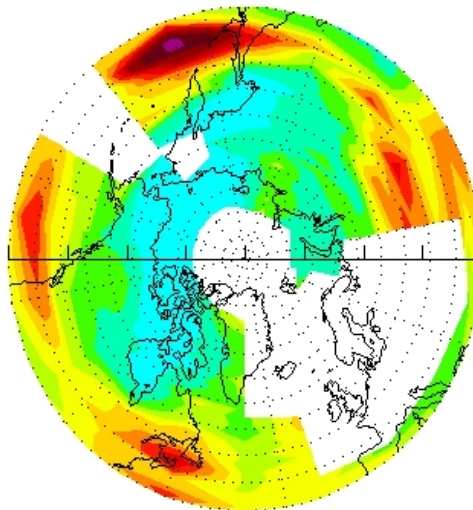
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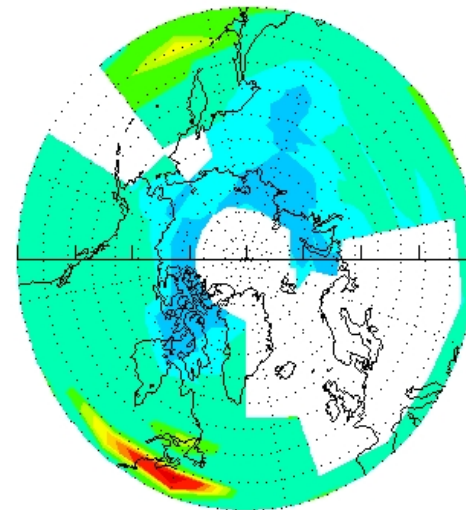
14.5 KM



18.5 KM

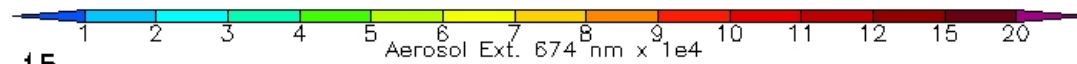


22.5 KM

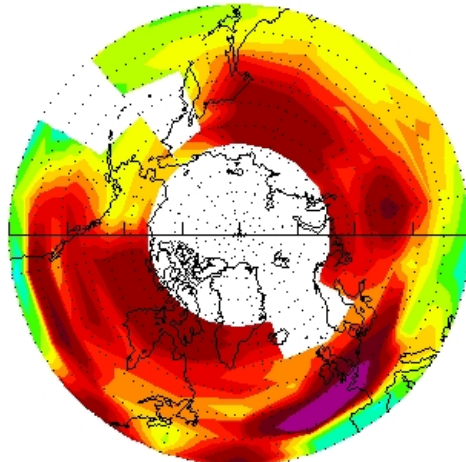




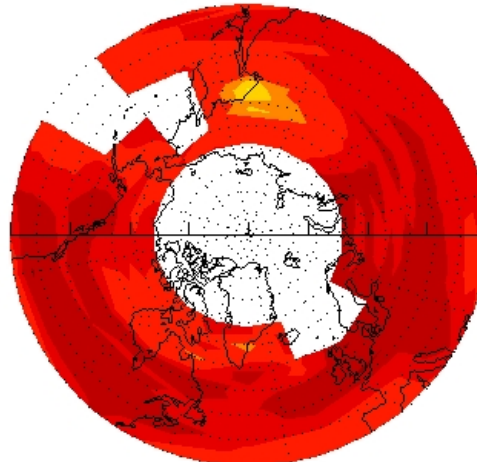
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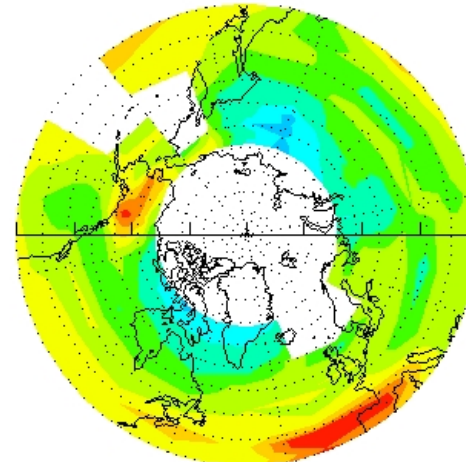
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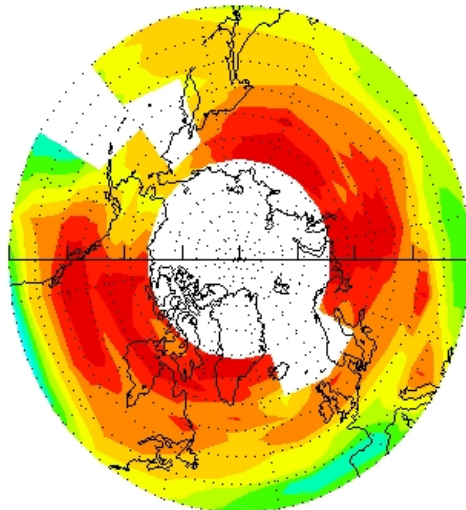
16.5 KM



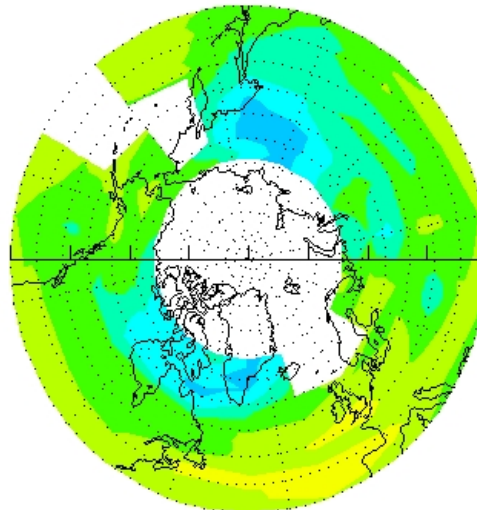
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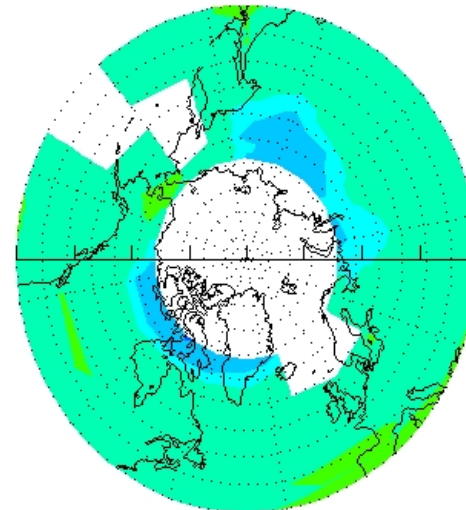
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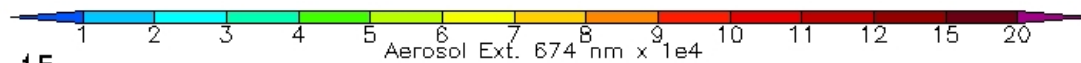
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22.5 KM

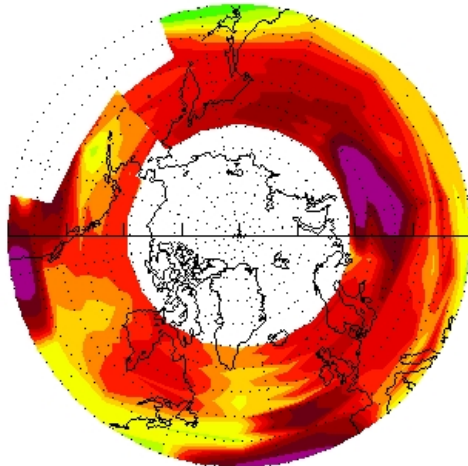


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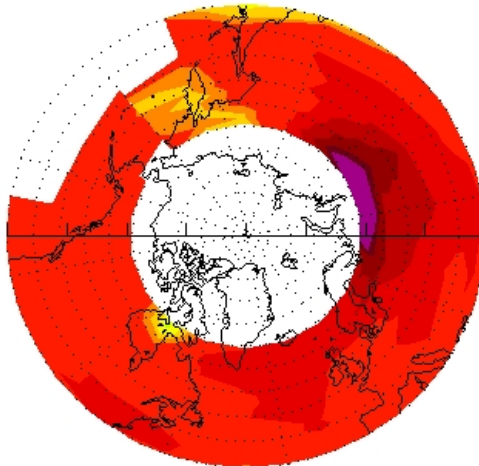


Aerosol Ext. 674 nm x 1e4

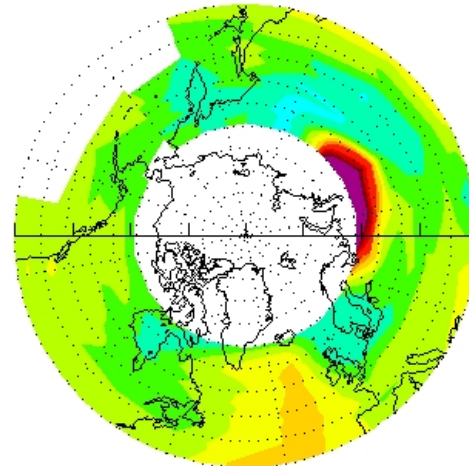
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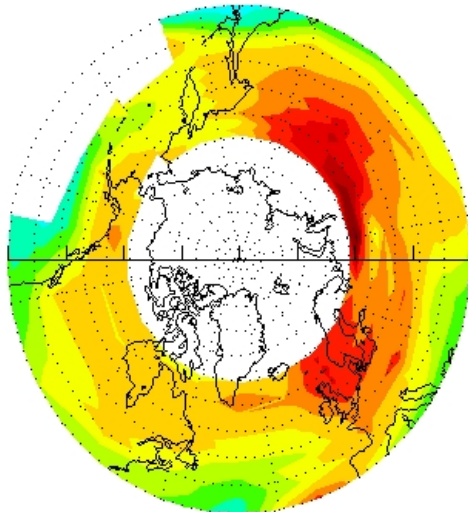
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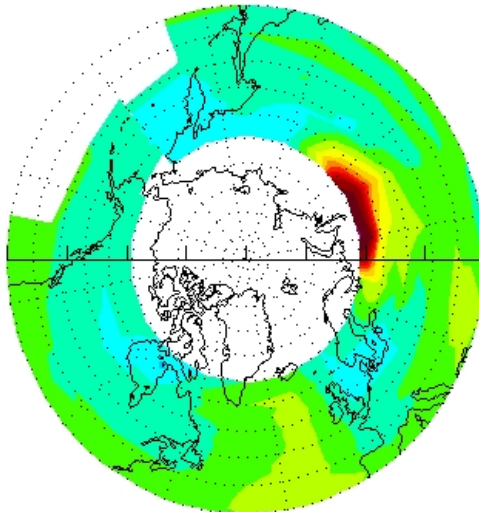
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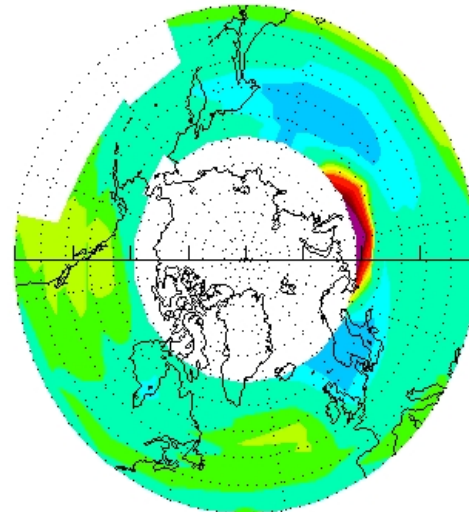
14.5 KM



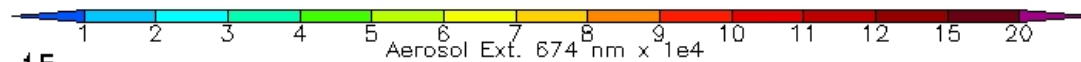
18.5 KM



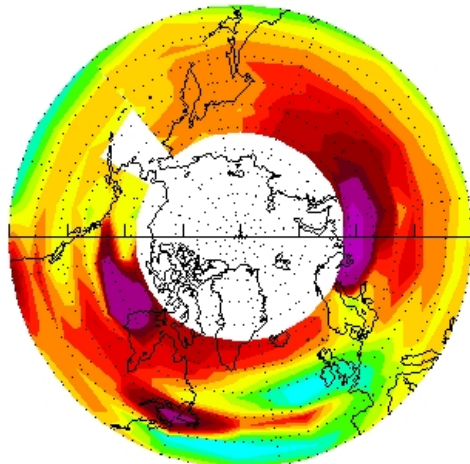
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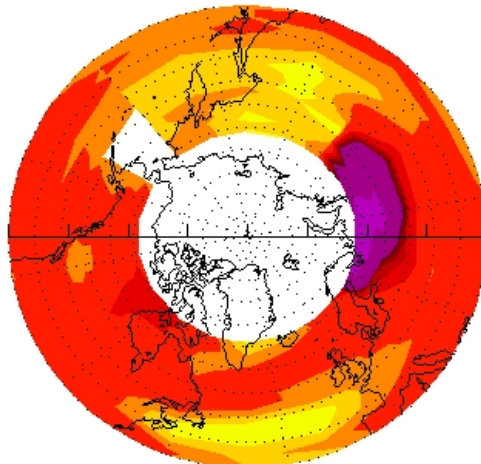
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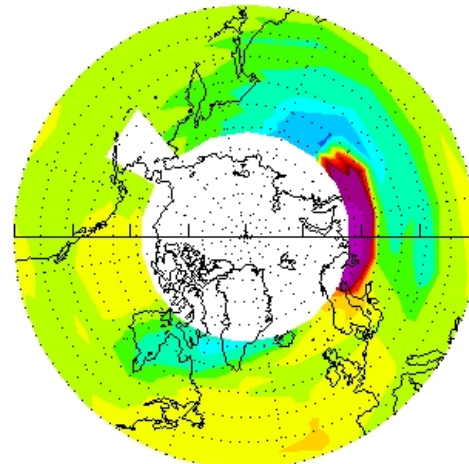
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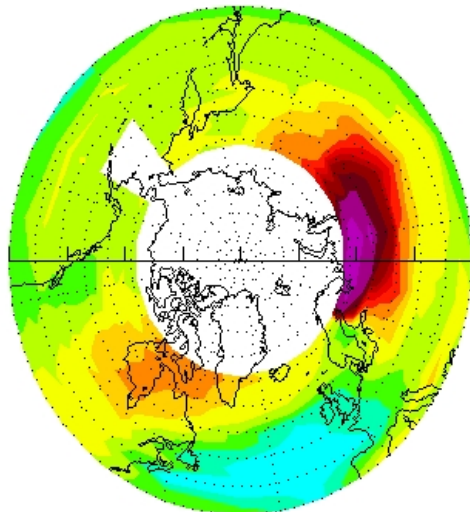
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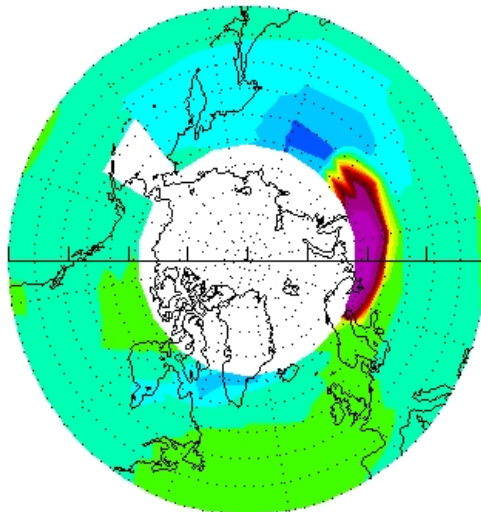
20.5 KM



14.5 KM



18.5 KM



22.5 KM

