LightningCast Probabilities and their creation

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(CIMSS)

Many Thanks to John Cintineo, Levi Pfantz, Graeme Martin who should probably be co-authors

LightningCast Probabilities

- I talked about LightningCast back in June (2024)
  - Link to Presentation
  - Link to Questions after Presentation

- Why is this Product worth talking about again so soon?
  - There is now a Beta Version of the software that creates the imagery/products – please test it out and give feedback
  - The product is so very useful for Decision Support with respect to lightning awareness

What is LightningCast Probability

- A machine-learning tool that has been trained on ABI/GLM data
  - Given the present configuration of multispectral data (0.64 μm, 1.61 μm, 10.3 μm, 12.2 μm), what is the likelihood that a GLM observation will occur in the next 60 minutes?
    - The Machine Learning Tool works on the distributions of the four fields and relates them to past distributions that were followed by lightning
- Spoiler alert: I really like this product
  - Useful for Lightning Anticipation
  - Useful for Convective Initiation Anticipation

There is training available on LightningCast (created for HWT)

- https://cimss.ssec.wisc.edu/training/TrainingVideos/LightningCastTraining_2024.mp4
  - (Link from this website: https://cimss.ssec.wisc.edu/training/TrainingVideos.html

- **Input: ABI Channels**
  - Band 2, Band 5, Band 13, Band 15 (0.64 μm, 1.61 μm, 10.3 μm, 12.3 μm)
- **Input: AHI Channels [originally created for WFO GUM]**
  - Band 3, Band 5, Band 13, Band 15 (0.64 μm, 1.61 μm, 10.4 μm, 12.3 μm)

- **Output: Likelihood of GLM Observation in the next 60 minutes.**

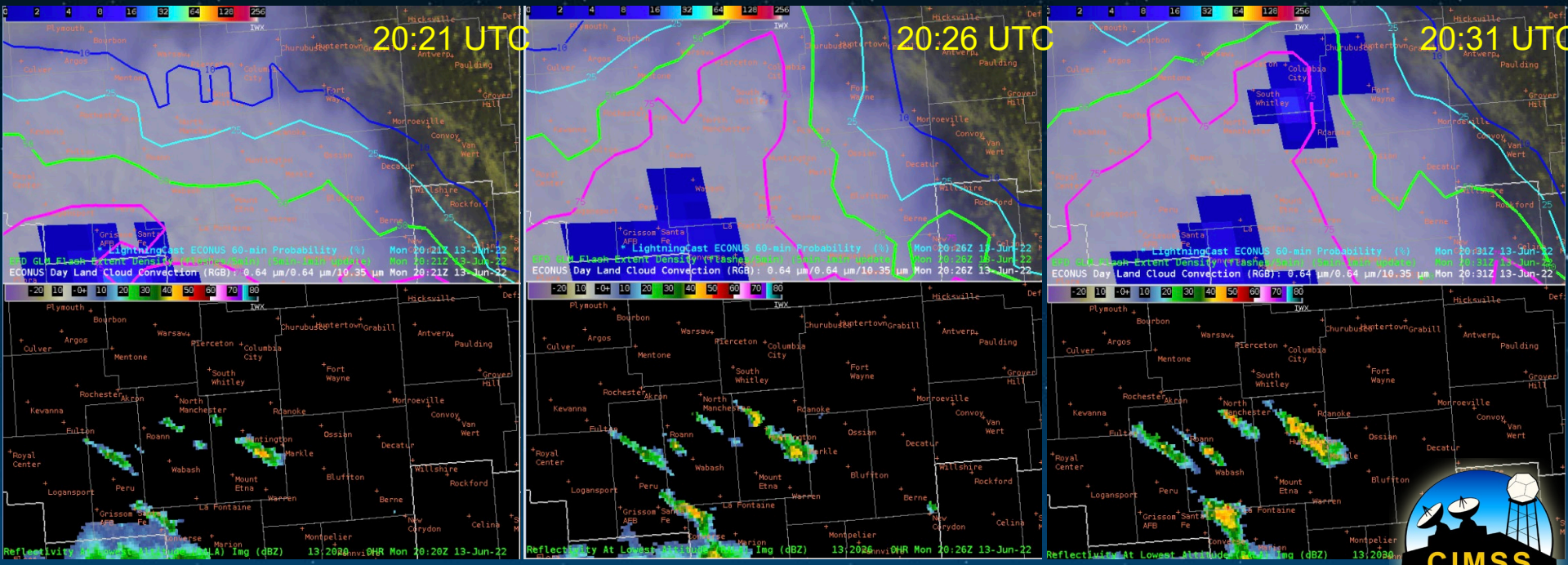
- **Real-Time product is available online: https://cimss.ssec.wisc.edu/severe_conv/pltg.html**
- **Weather and Forecasting paper on this product: https://journals.ametsoc.org/view/journals/wefo/37/7/WAF-D-22-0019.1.xml (other link here)**

Important Caveat: If you can't see the low-level development with your own eyes, LightningCast won't either; Thick cirrus is an issue

Tuesday, June 14, 2022

Where is the new convection going up?

https://goesrhwt.blogspot.com/2022/06/where-is-new-convection-going-up.html



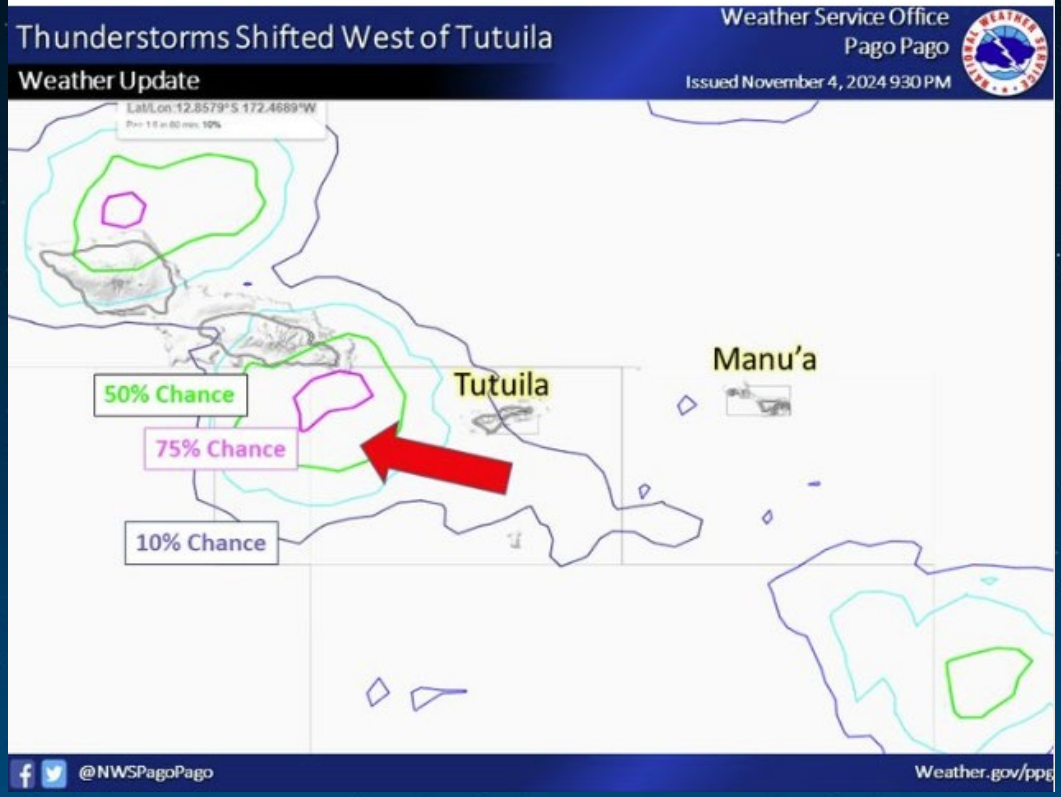
Decision Support!

US National Weather Service Pago Pago American Samoa
November 5 at 2:56 AM ·

The thunderstorms have passed to the west of Tutuila, and it is now safe to go outside. However, please be aware that additional thunderstorms may form later tonight or in the week as the trough remains over the Islands.

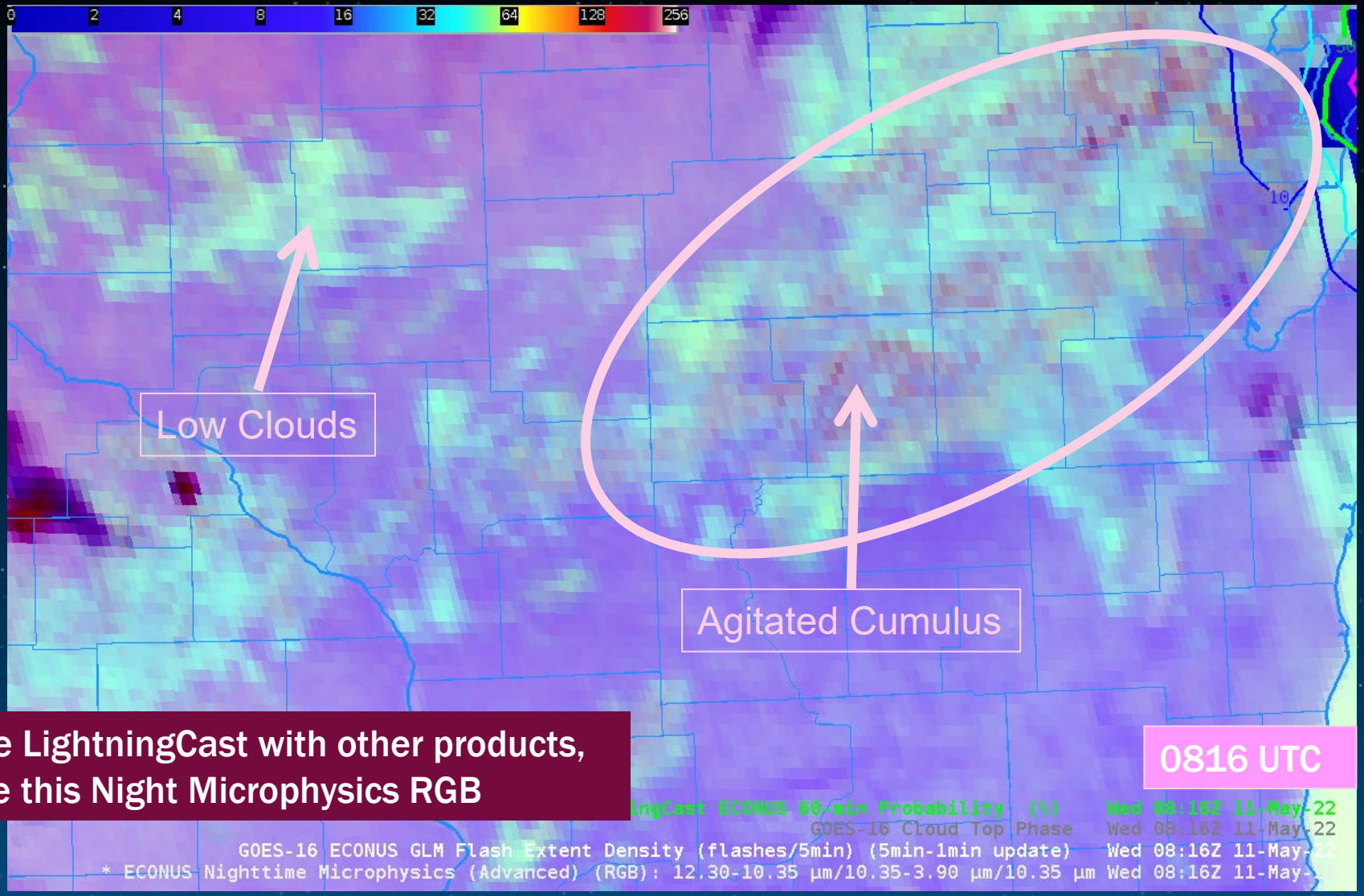
We will continue to provide updates with any changes to the forecast. Thanks for staying with us!

Ua aga'i i sisifo faitītili sa iai i luga o le atunu'u, e saogalemu le feoaiga i le afiafi nei. Peita'i, e mafai ona faatupulaia faitītili i se taimi lata mai... See more



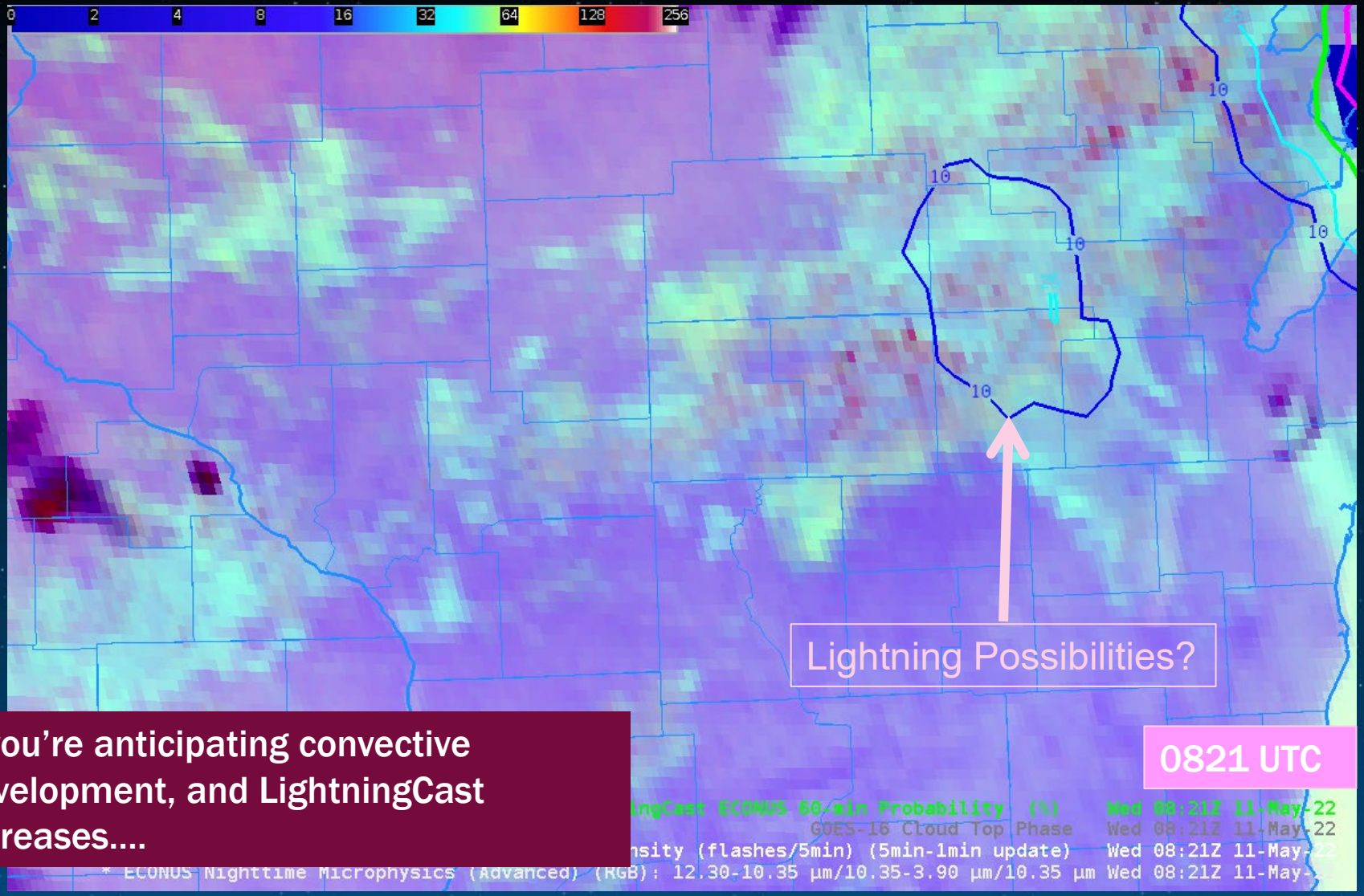
[Facebook Post from NWS in Pago Pago](#) showing LightningCast contours

LightningCast Probability is useful for Decision Support and for monitoring Convective Initiation



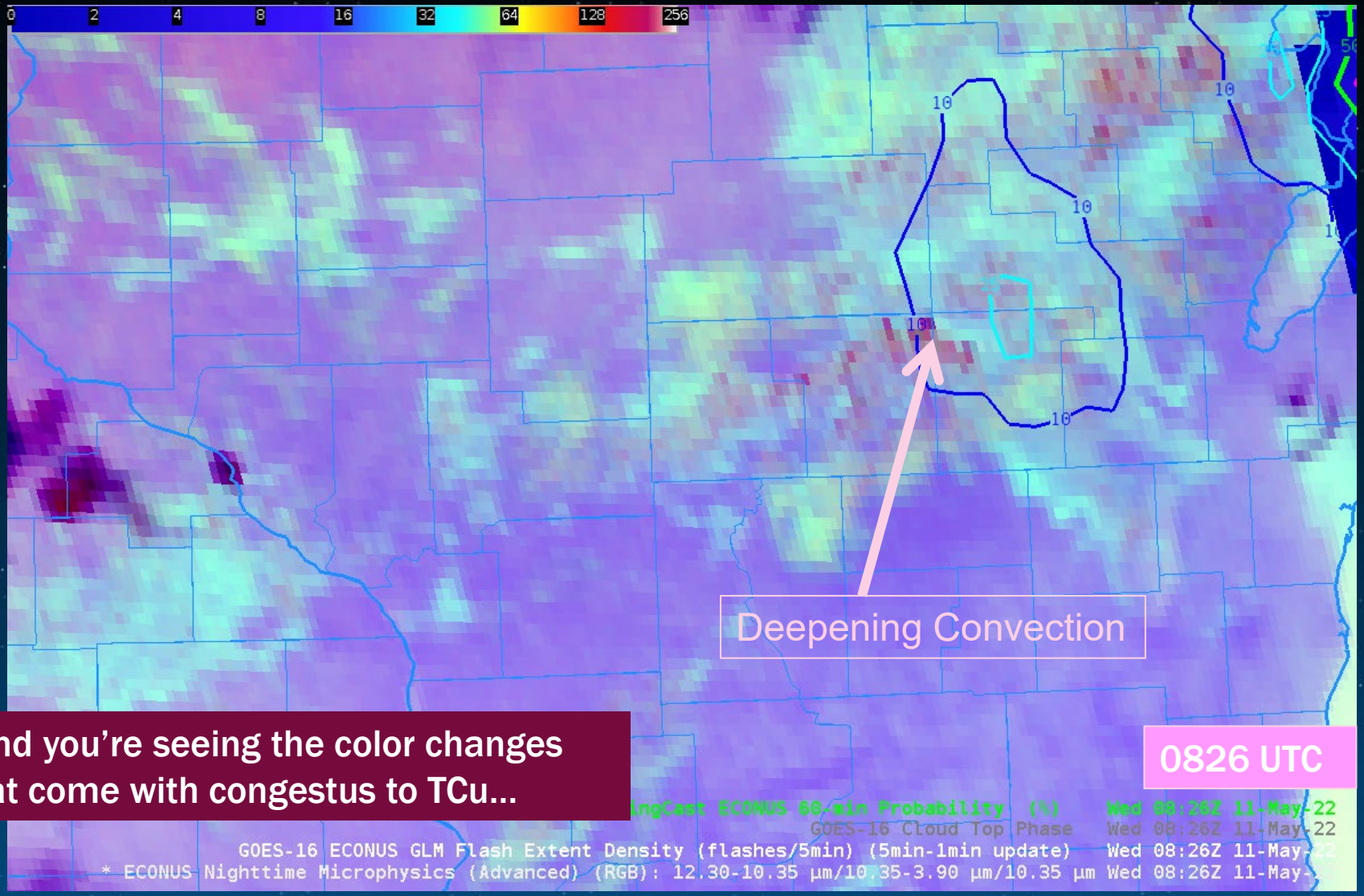
Use LightningCast with other products, like this Night Microphysics RGB

LightningCast Probability is useful for Decision Support and for monitoring Convective Initiation



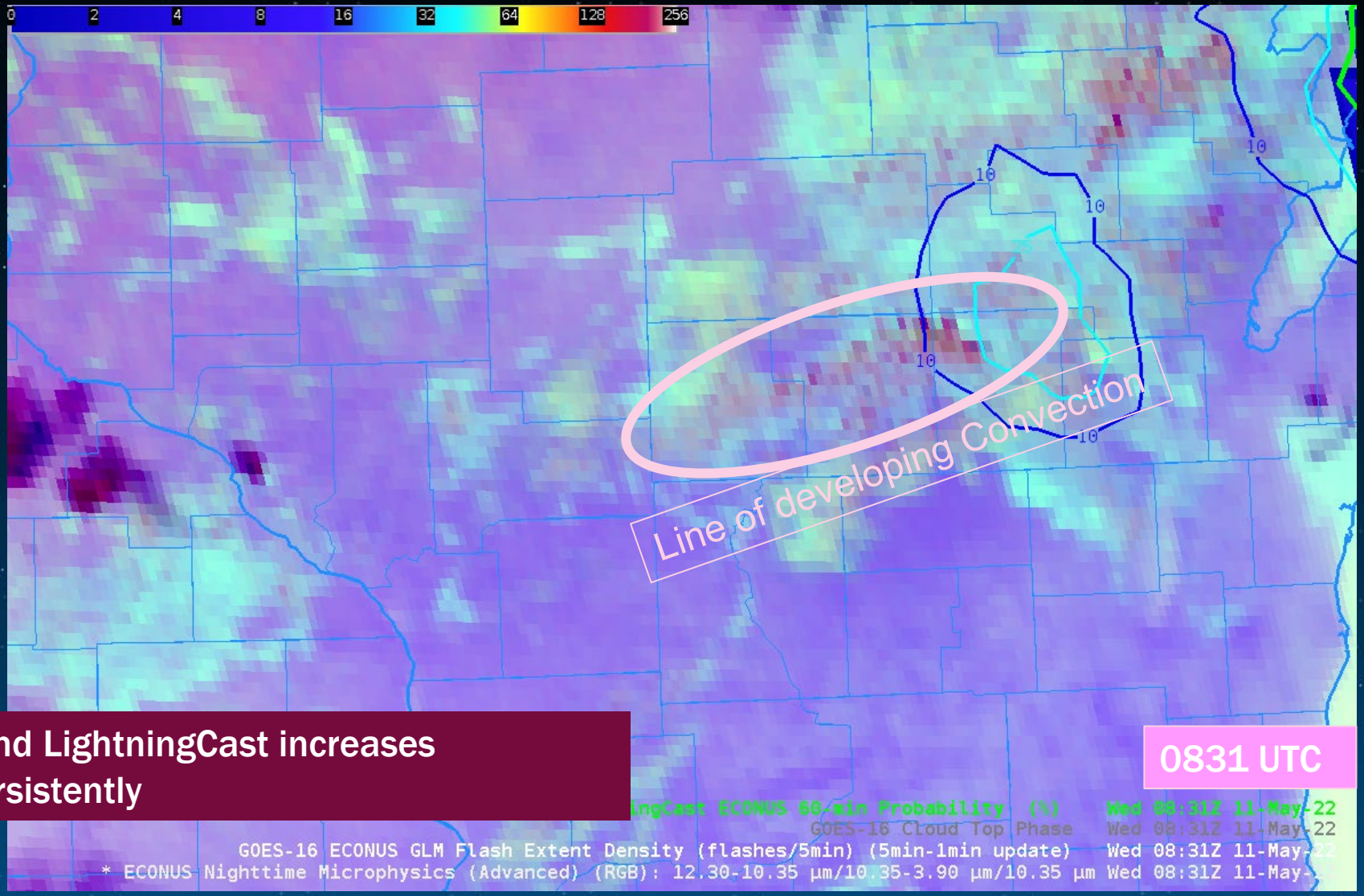
If you're anticipating convective development, and LightningCast increases....

LightningCast Probability is useful for Decision Support and for monitoring Convective Initiation



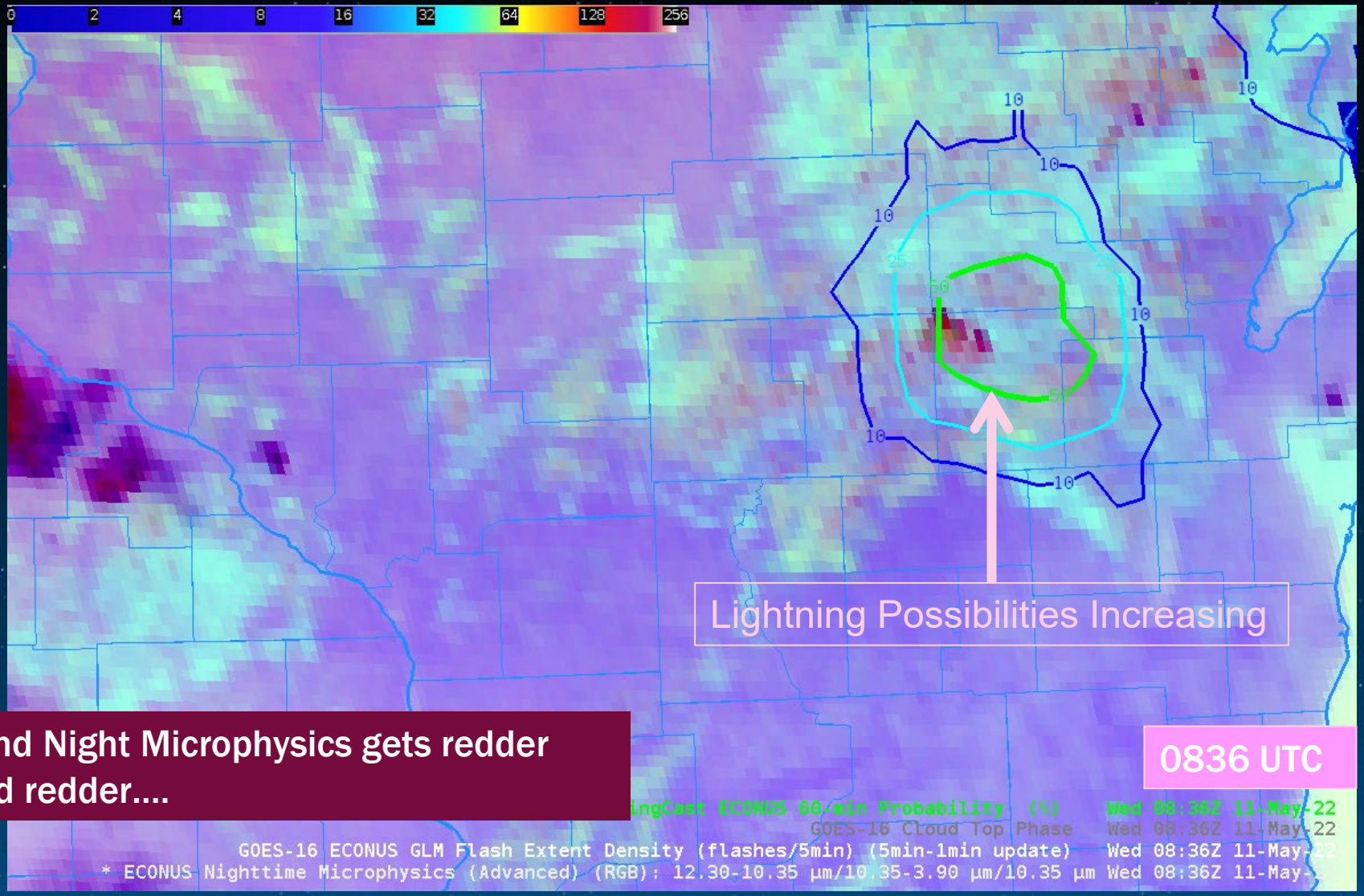
..and you're seeing the color changes that come with congestus to TCu...

LightningCast Probability is useful for Decision Support and for monitoring Convective Initiation



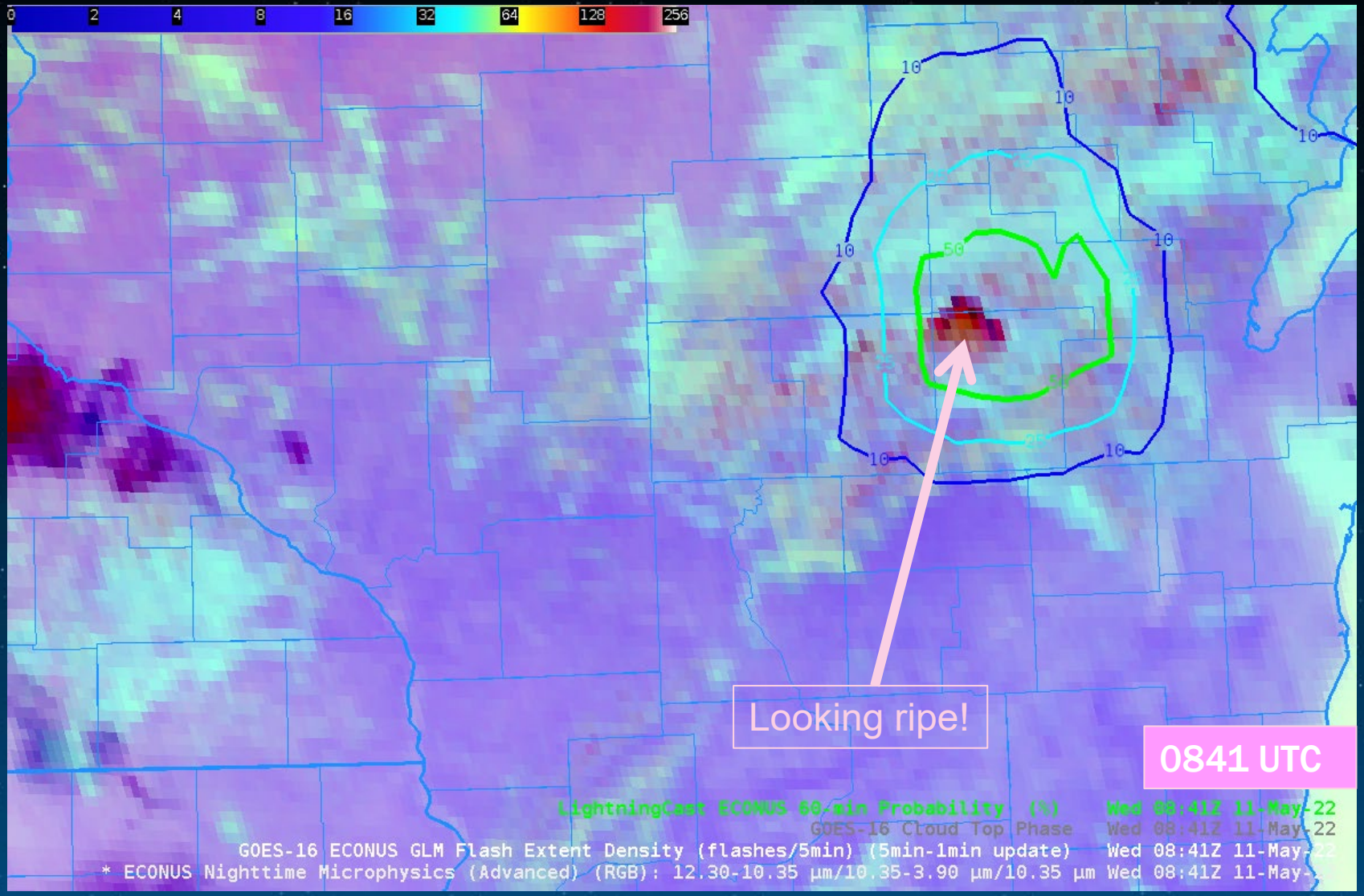
..and LightningCast increases persistently

LightningCast Probability is useful for Decision Support and for monitoring Convective Initiation

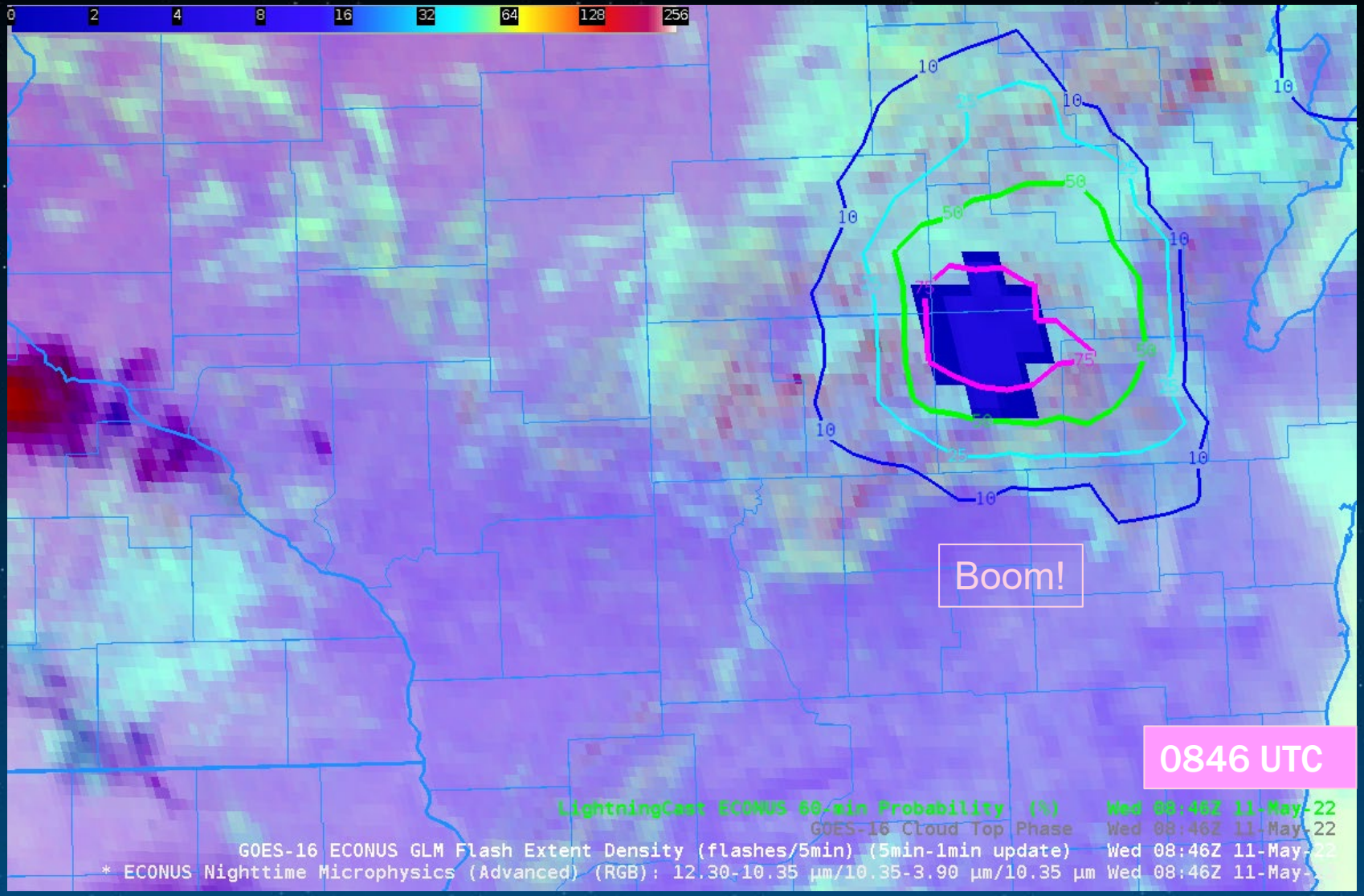


..and Night Microphysics gets redder and redder....

LightningCast Probability is useful for Decision Support and for monitoring Convective Initiation



LightningCast Probability is useful for Decision Support and for monitoring Convective Initiation



More examples from the CIMSS Blog

- Summer case Southern WI/Northern IL
- Winter case (High Plains Blizzard)
- Hawaii and Guam Examples
- Island Effect lightning on Guam

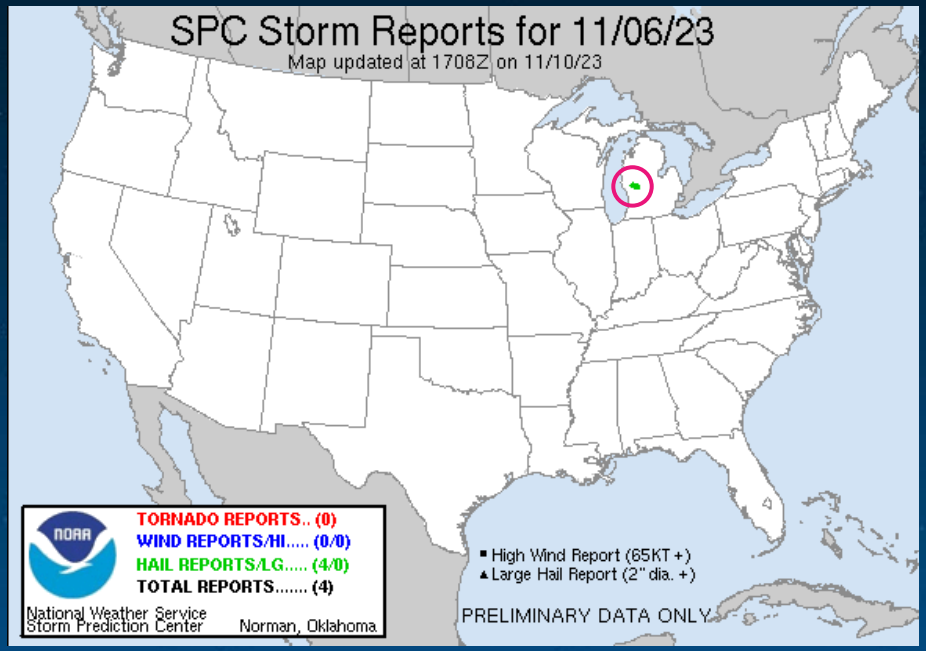
- But what if you don't have access to AWIPS or to the RealEarth instance that displays LightningCast probabilities? (Or what if the case you are interested in happened a long time ago?)

CSPP Software (Beta Release) to compute LightningCast

- Download the software from the CSPP Website https://cimss.ssec.wisc.edu/csppgeo/
- Have access to ABI level 1b RadC/F/M1/M2 files
- Have access to AHI HSD Files
- Works for
  - GOES-16/-17/-18/-19
  - Himawari-9/-8
- Science Software by John.Cintineo (@noaa.gov)
- CSPP Beta implementation by Levi Pfantz at SSEC (lpfantz@wisc.edu)

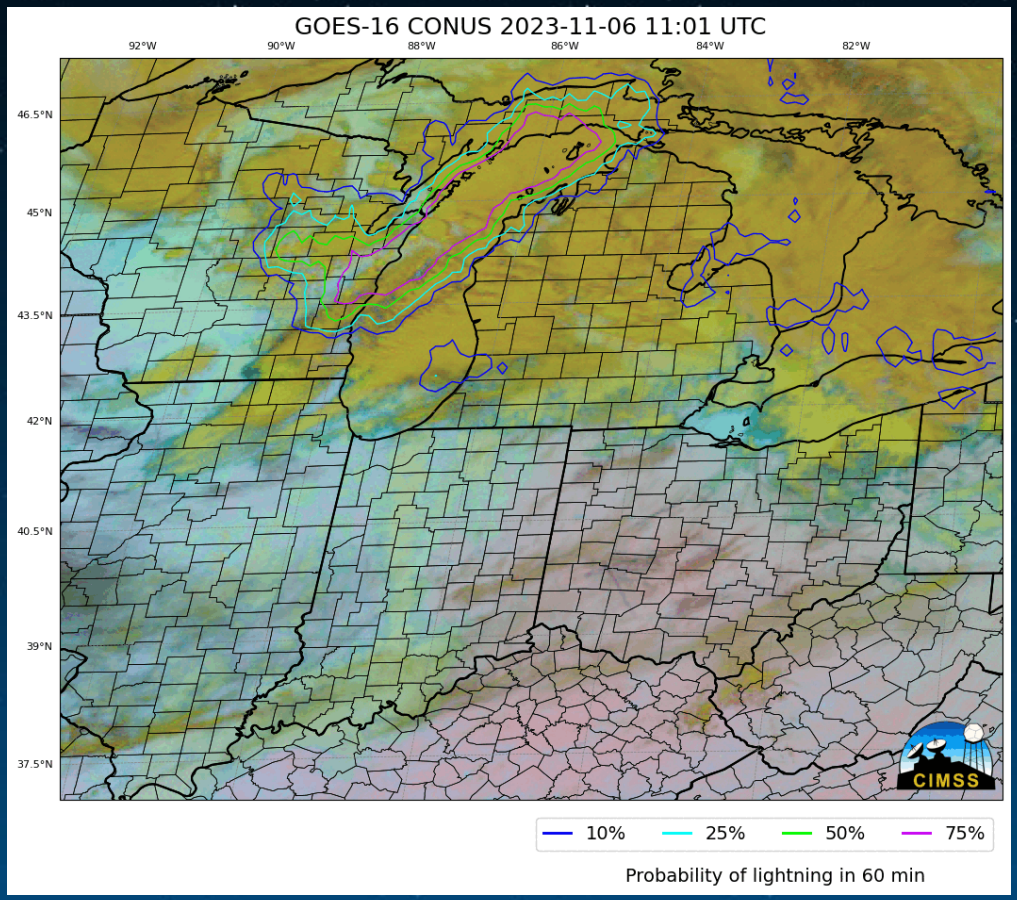
Create examples from long ago

- Let's say you view a Satellite Book Club presentation on a Hail Event in SW Lower Michigan in November (2003) and are curious to see what the LightningCast probabilities showed then



Sample LightningCast invocation

- ./lightningcast –make-vis-image –netcdf –ll-bbox -95.0 -85.0 35.0 44.0 /path_to_goes16grb/2024/2024_08_24_237/abi/L1b/RadC/OR_ABI-L1b-RadC-M6C02_G16_s20242371901*



Or, you read about a lightning event…

British Columbia

B.C. helicopter flight lands safely after being hit by lightning, Helijet says

LINK

2 pilots, 12 passengers unhurt; strike happened 20 minutes into Vancouver-Victoria flight, Helijet CEO says

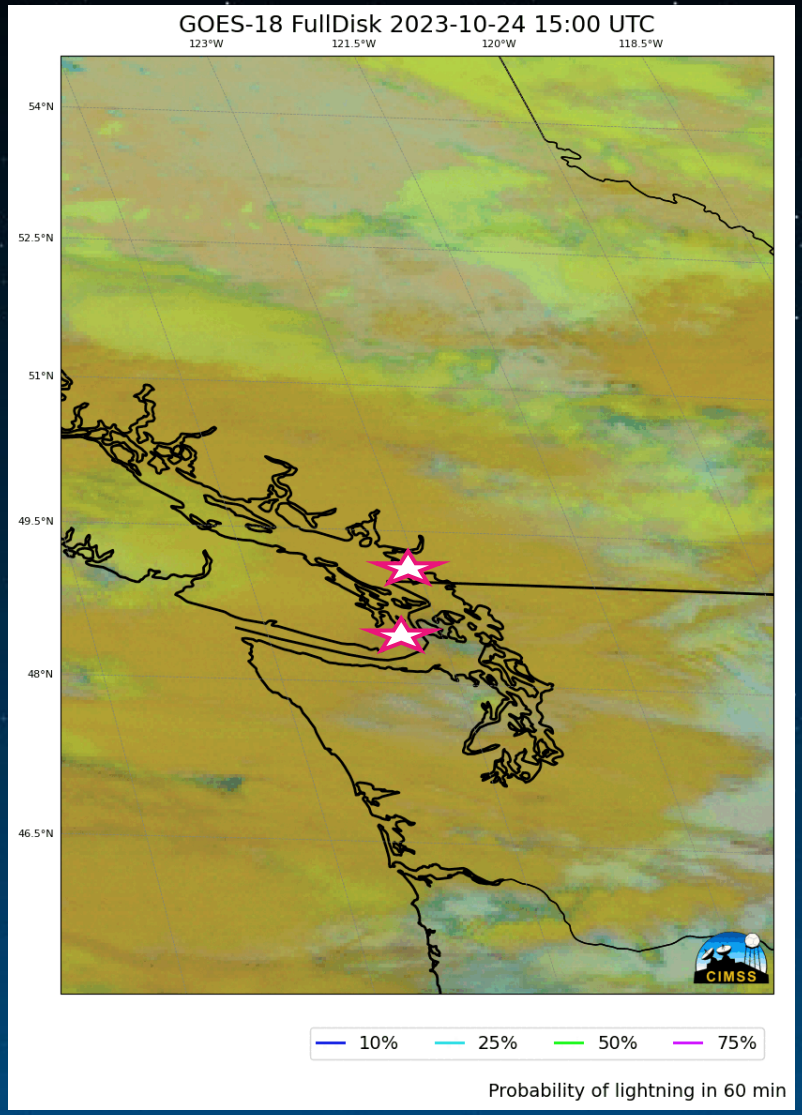
The Canadian Press · Posted: Oct 25, 2023 2:16 PM CDT | Last Updated: October 25, 2023

A HeliJet helicopter is pictured in downtown Vancouver in October 2020. The company says one of its commercial helicopters landed safely in Victoria on Tuesday after it was struck by lightning. (Ben Nelms/CBC)

Was there a diagnosable lightning threat?

What does LightningCast look like for this event?

10-minute FD imagery



LightningCast was highlighting different regions between Vancouver and Victoria

Is there a clear signal?

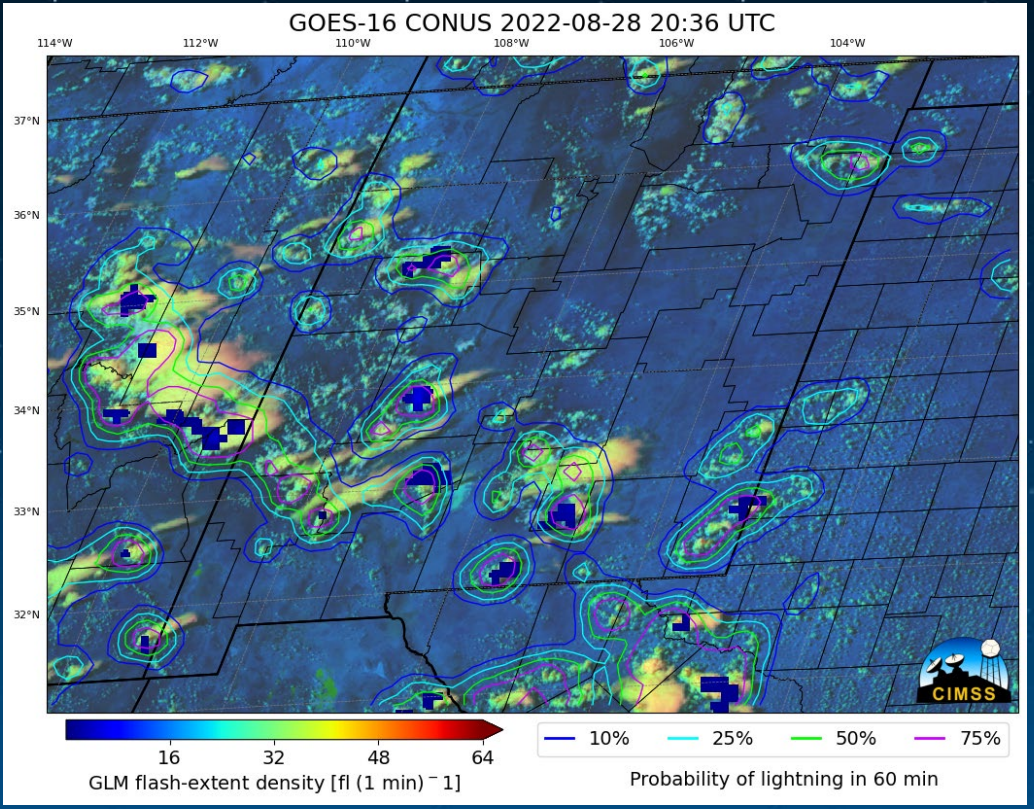
Beta Version allows you to create an imagery you want

- Seeking feedback!
- What works well for you?
- Are there features that should be added?

- Download the Beta from this website – where there are also links to a ReadMe and a Users' Guide: https://cimss.ssec.wisc.edu/csppgeo/
- Check out the CIMSS Blog Posts on this software as well: Search on 'LightningCast':
  - https://cimss.ssec.wisc.edu/satellite-blog/?s=LightningCast

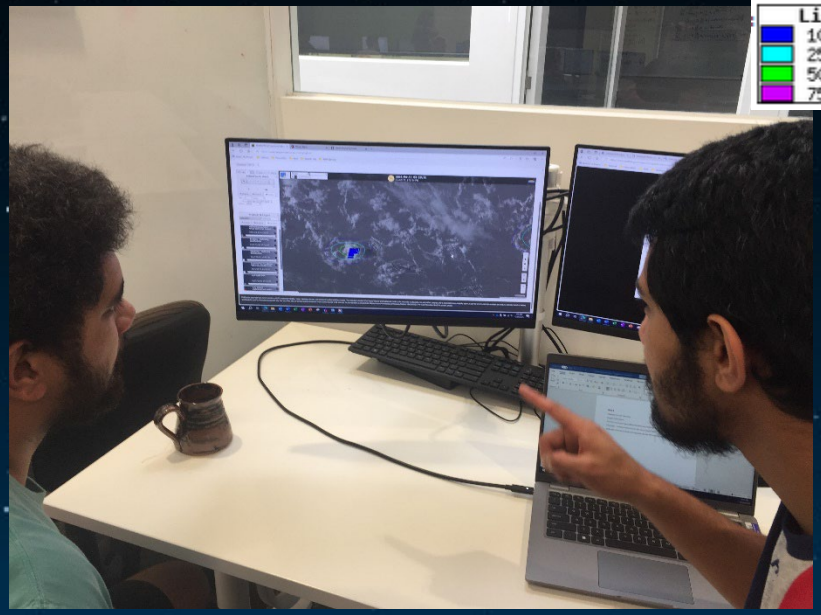
LightningCast code invocation

- ./lightningcast –skip-geojson –county-map –make-dcp-image –ll-bbox -110.0 -102.0 31.0 37.0 /path_to_goes16_data/2022/2022_08_28_240/abi/L1b/RadC/*M6C02*s20222402036* –gridded-glm /path_to_gridded_GLM/grids/GOES-16/2022/08/28/
  - The code is designed to take just one argument: the location of the GOES-R (or Himawari) level-1b files



Thank you Bodo for forwarding along this example!

Our BMTC Pacific Island students examining NOAA/CIMSS LightningCast output over Samoa during our "Forecasting Day"

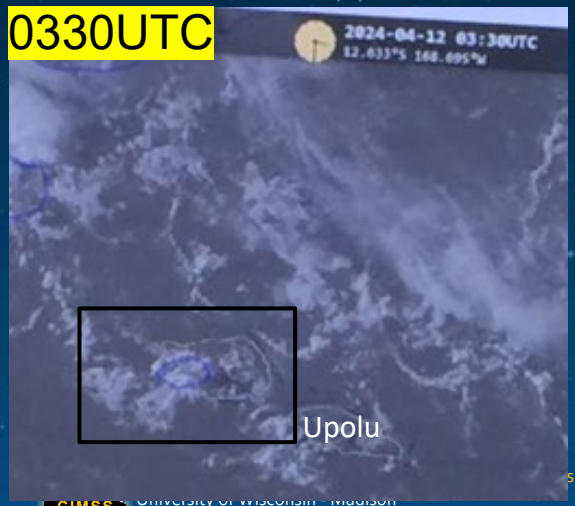


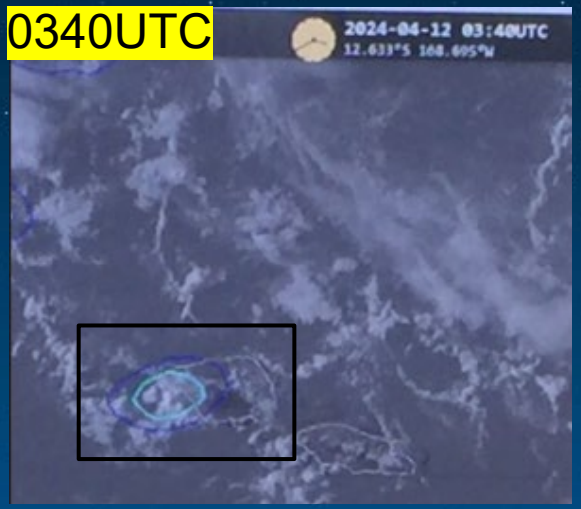
Photos taken between 0403UTC and 0405UTC with Alo and Sepi, 12th April 2024.

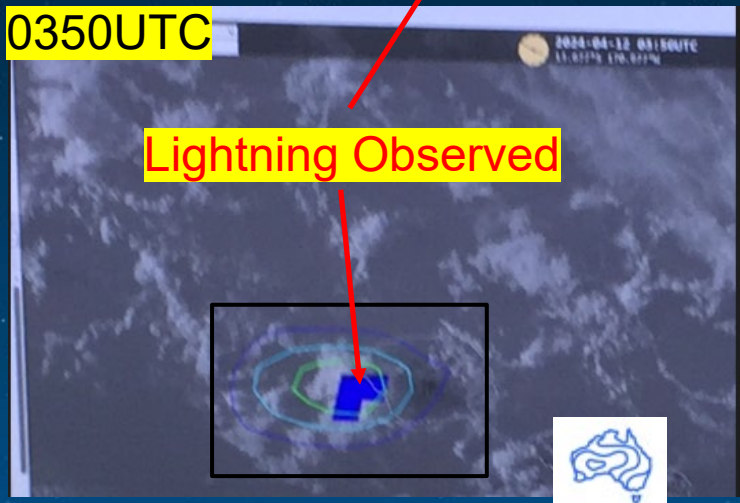
10% probability here

25% probability here

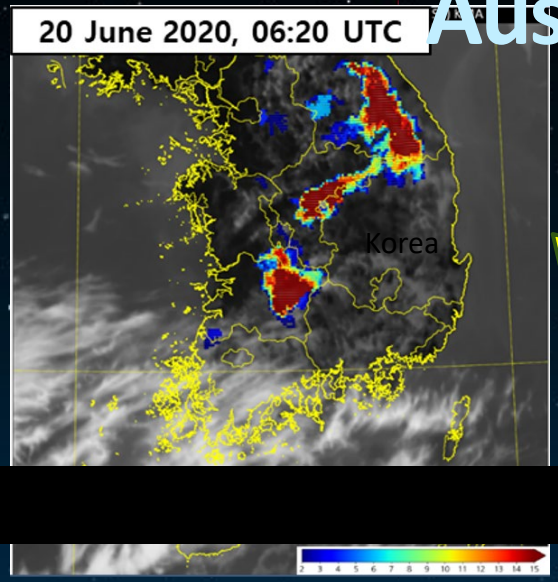
50% probability here and GLM signal

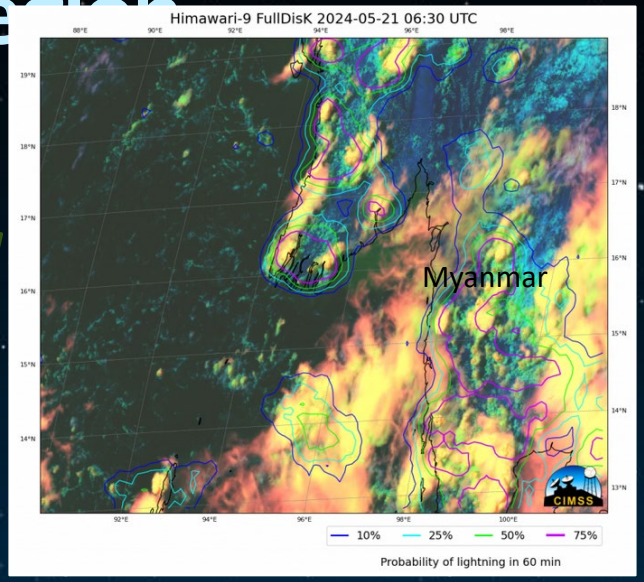




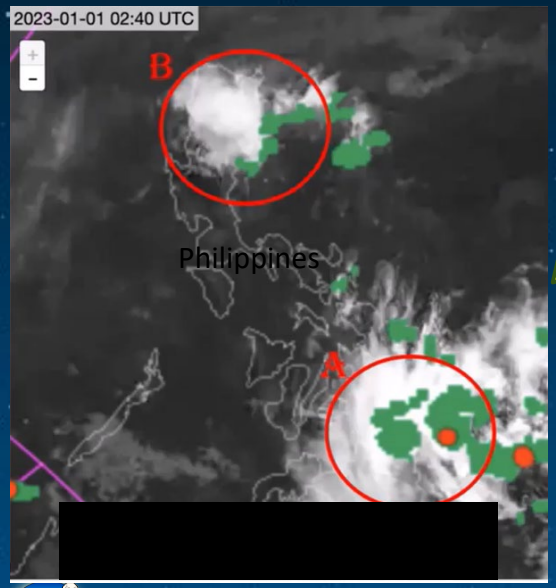


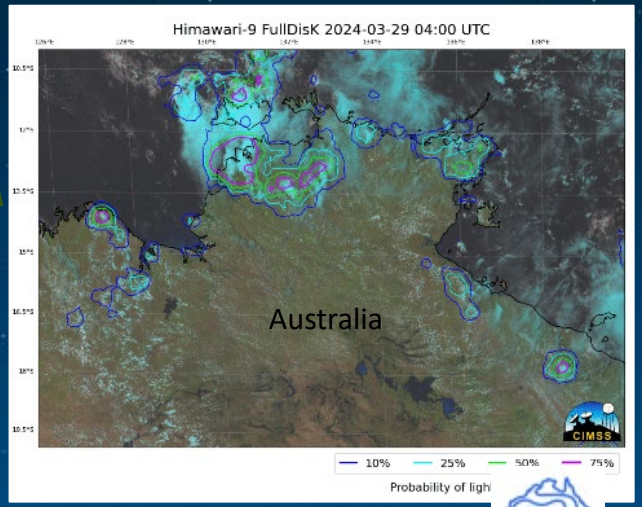
The great potential of LightningCast over the Australasia- Pacific region





Tuning the convection prediction algorithms by comparing output for the same case studies





1: images courtesy NOAA/CIMSS
2: image courtesy KMA

3: image courtesy JMA

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University of Wisconsin - Madison

Questions?

- scott.lindstrom@ssec.wisc.edu
- Download the Beta from this website – where there are also links to a ReadMe and a Users' Guide: https://cimss.ssec.wisc.edu/csppgeo/
- Many thanks to John Cintineo, Mike Pavolonis and Justin Sieglaff for creating this useful DSS tool.
  - John.cintineo@noaa.gov
  - Mike.pavolonis@noaa.gov
  - Justin.sieglaff@ssec.wisc.edu