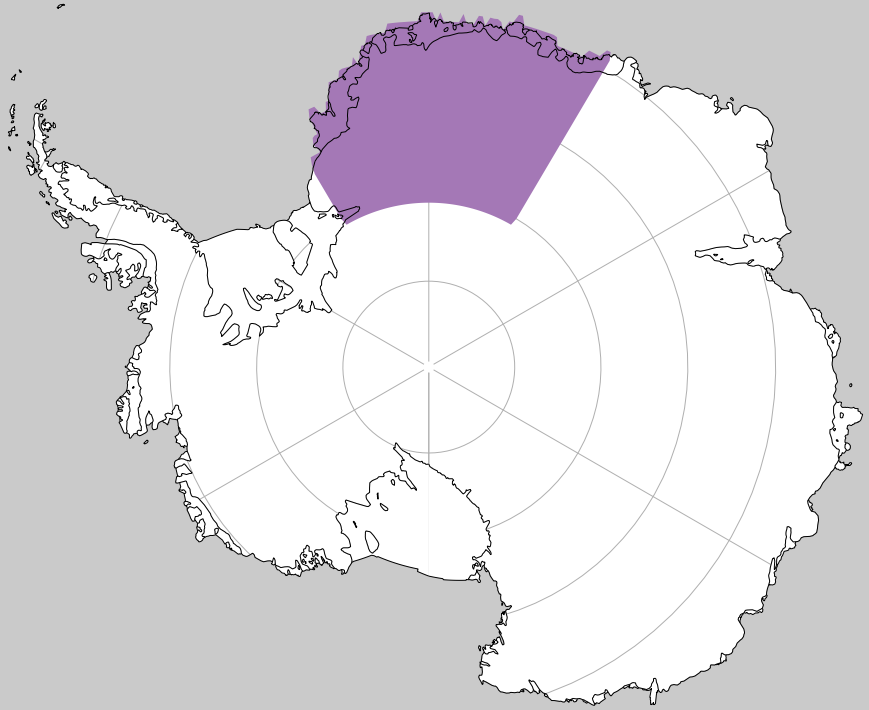

Synoptic Drivers of Landfalling Atmospheric Rivers Near Dronning Maud Land, Antarctica

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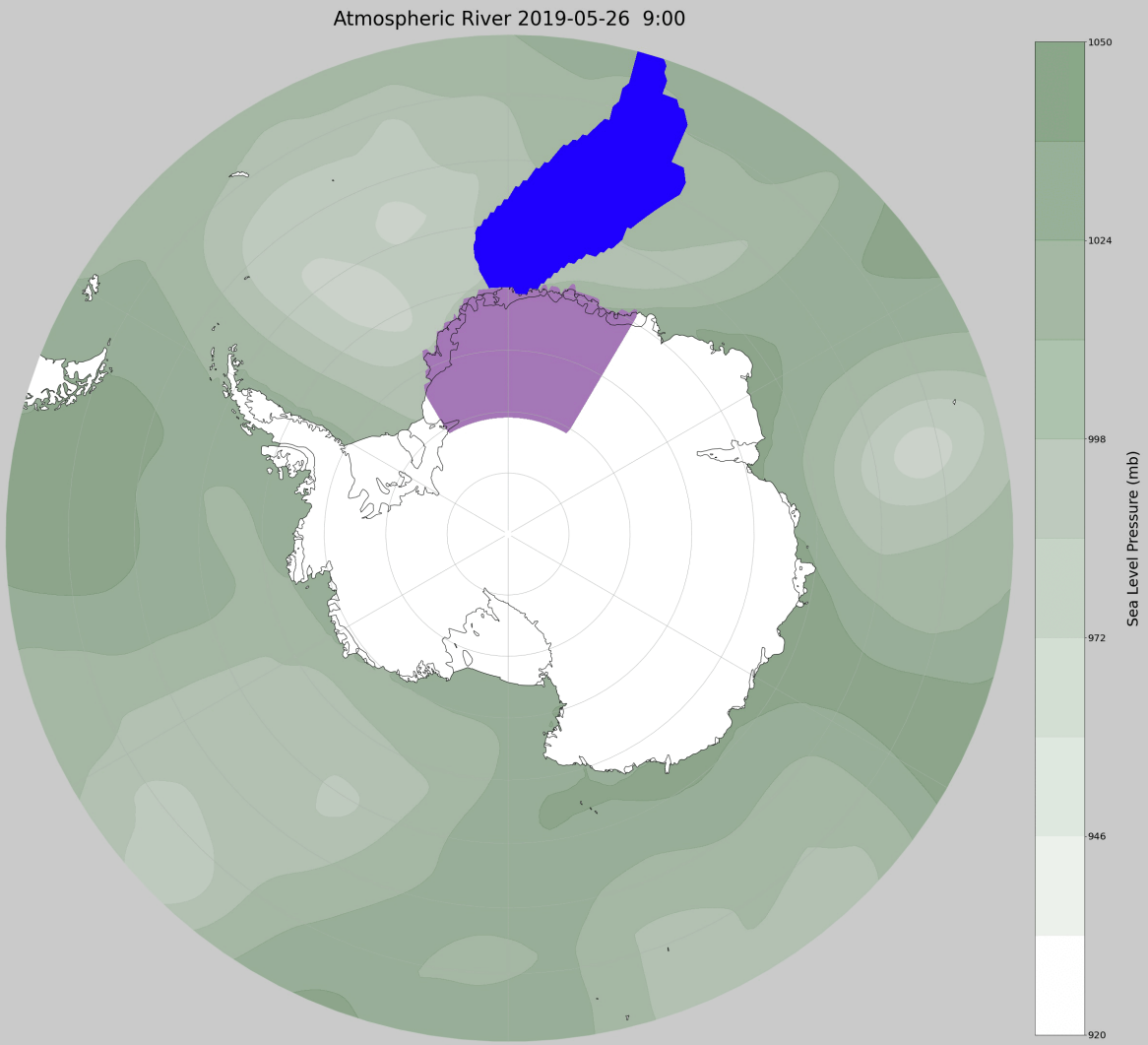
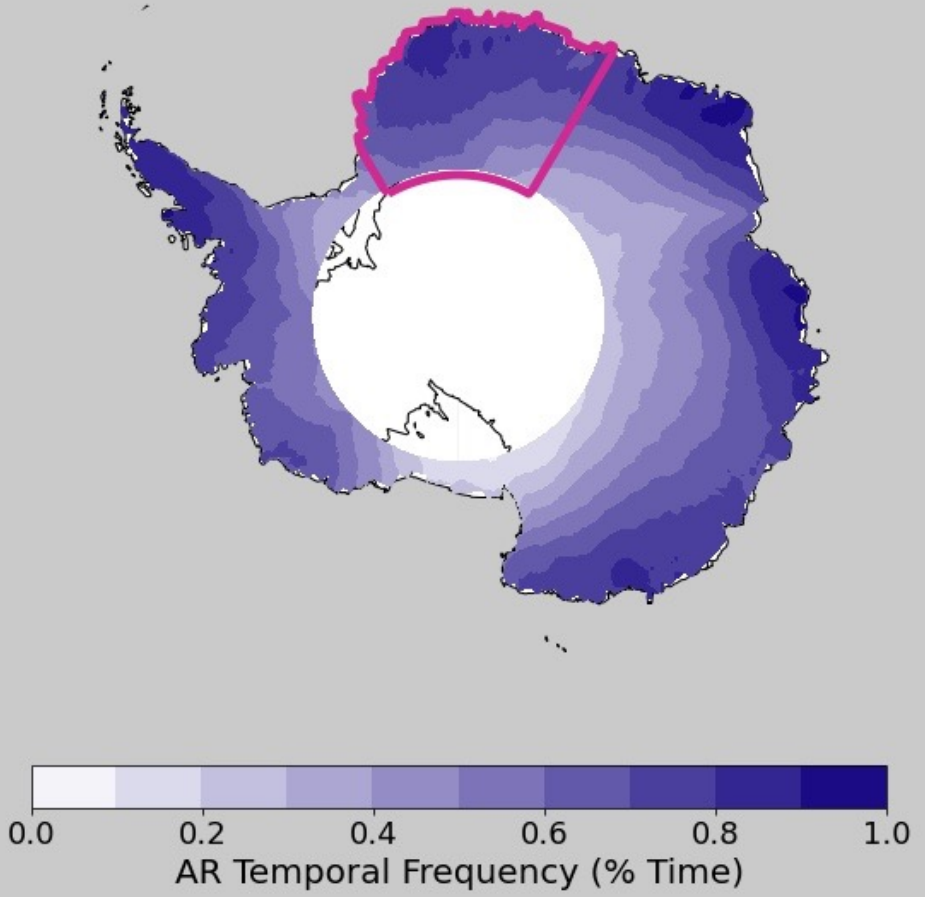
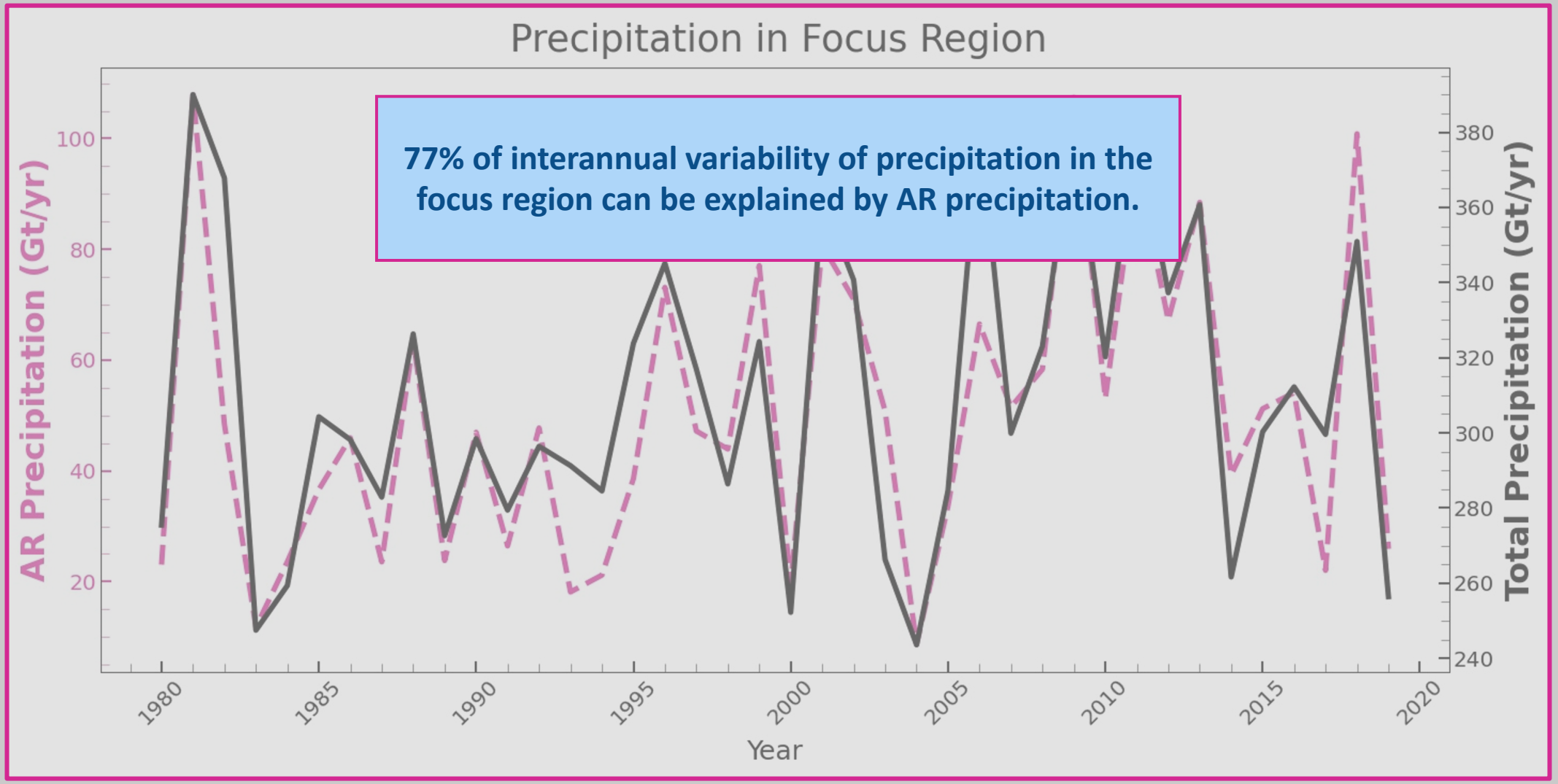
[2]National Center for Atmospheric Research

OSPP Participant:

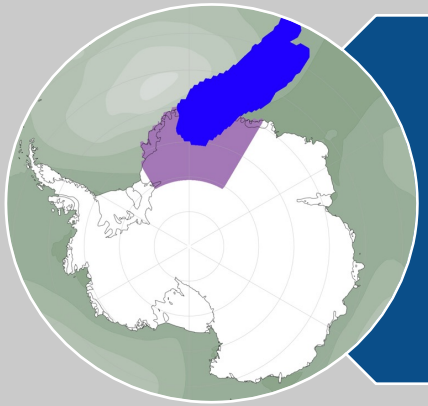


ARs reach focus region ~1% of all timesteps from 1980 to 2020

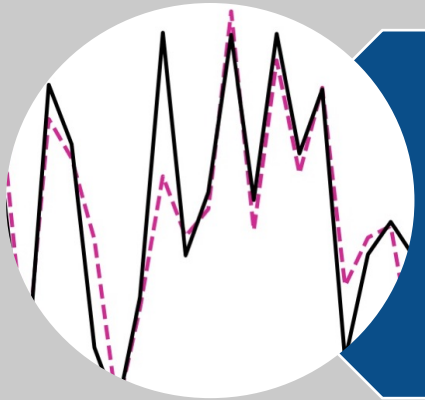



Precipitation in Focus Region
77% of interannual variability of precipitation in the focus region can be explained by AR precipitation.
AR Precipitation (Gt/yr)
Total Precipitation (Gt/yr)
Year
20
40
60
80
100
240
260
280
300
320
340
360
380
1980
1985
1990
1995
2000
2005
2010
2015
2020

What synoptic mechanisms…



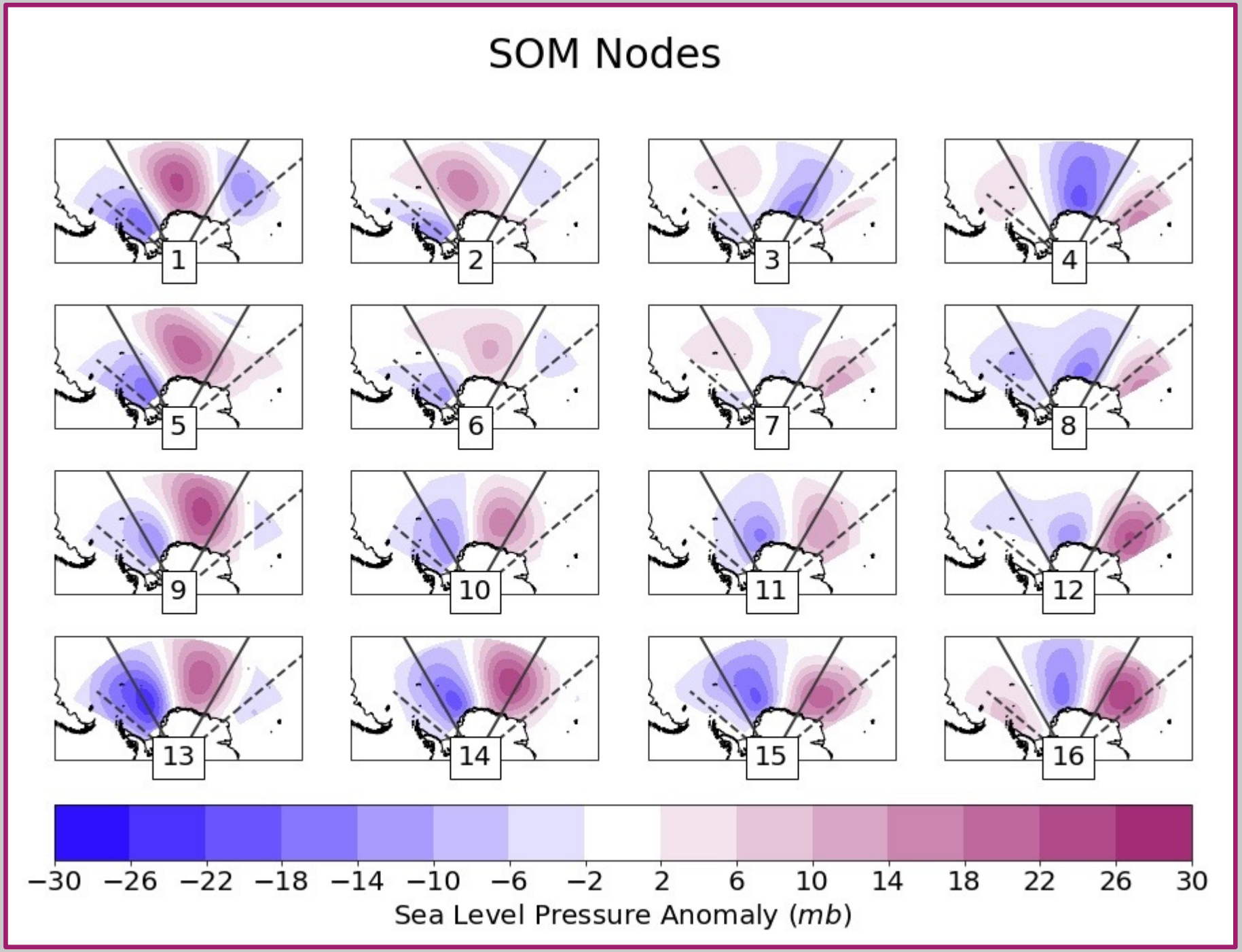
drive AR precipitation?



drive ***variability*** in AR precipitation?

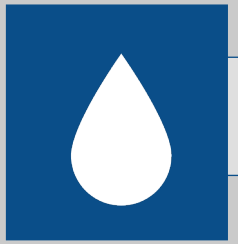
Using a self organizing map of sea level pressure anomalies at AR landfalling times

Almost all nodes feature an anomalous low high couplet



What mechanisms drive AR precipitation?

H/L — Intensity of the low high couplet

 — Available moisture

Q_S — Forcing for upwards motion from upper-level wave structure

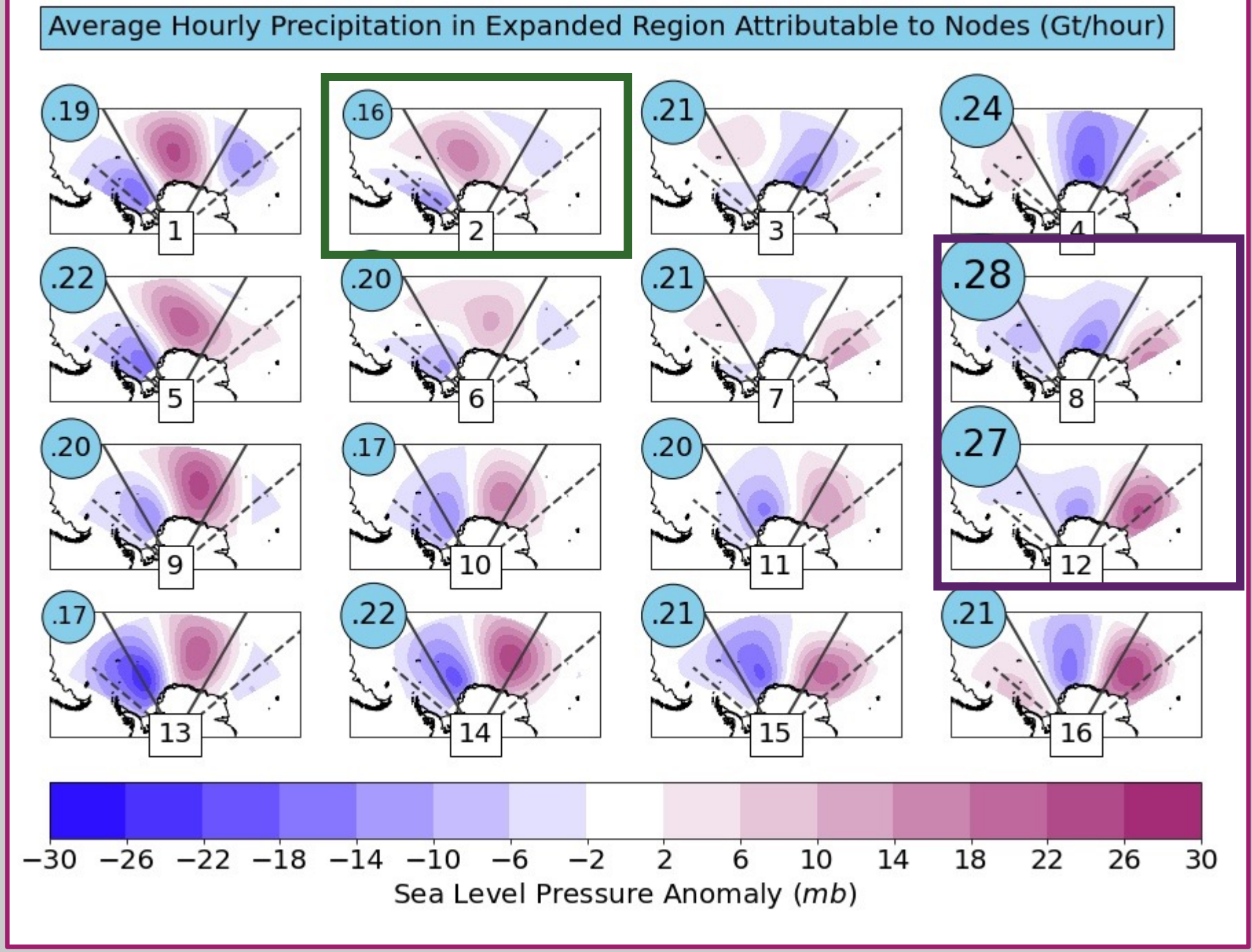
Q_N — Forcing for upwards motion from frontogenesis

QG — Overlap of forcing for upwards motion from Q_S and Q_N

Nodes 8 and 12 are the highest impact

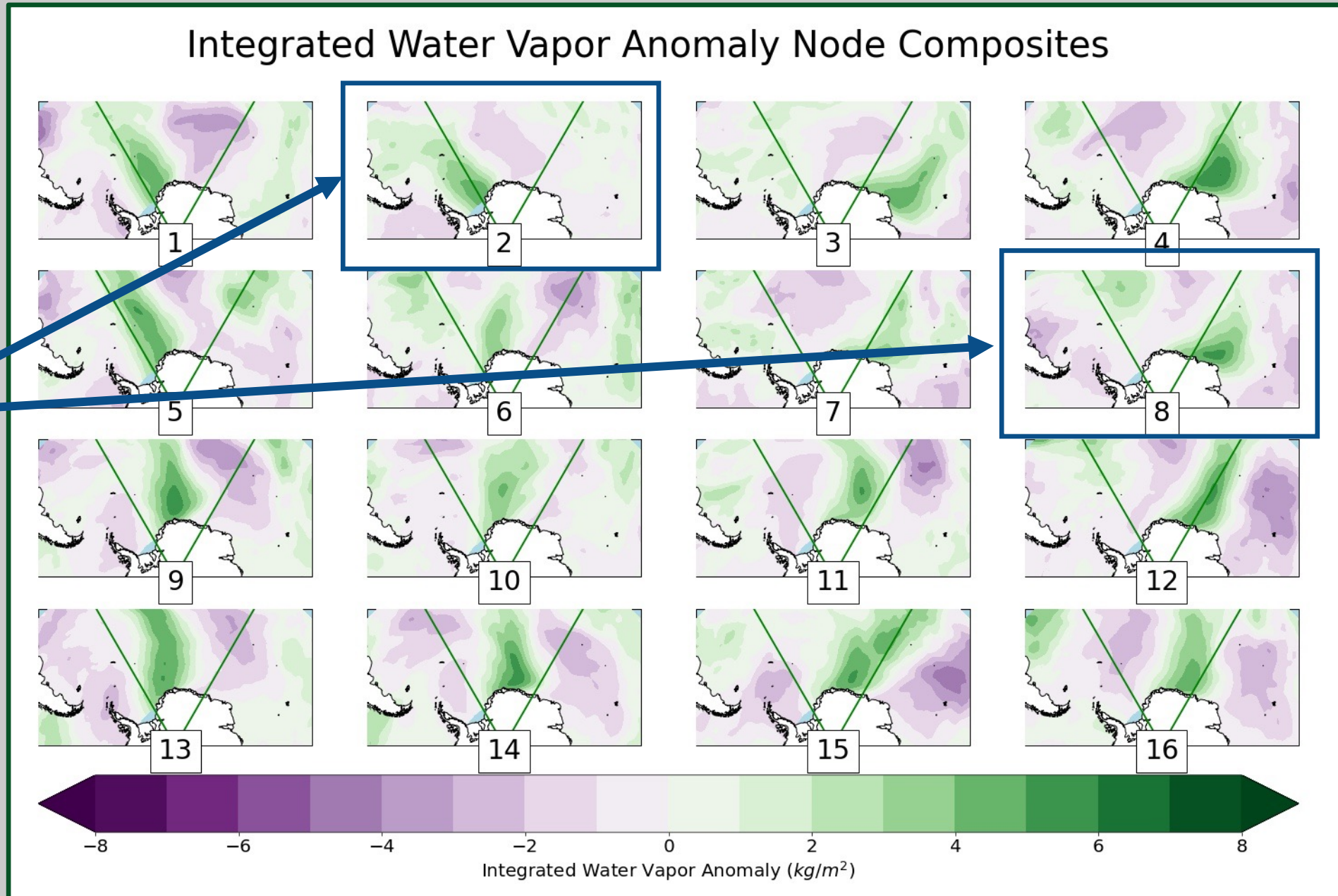
Node 2 is the lowest impact

Nodes with the strongest high low couplet are not necessarily the most impactful.



Available moisture

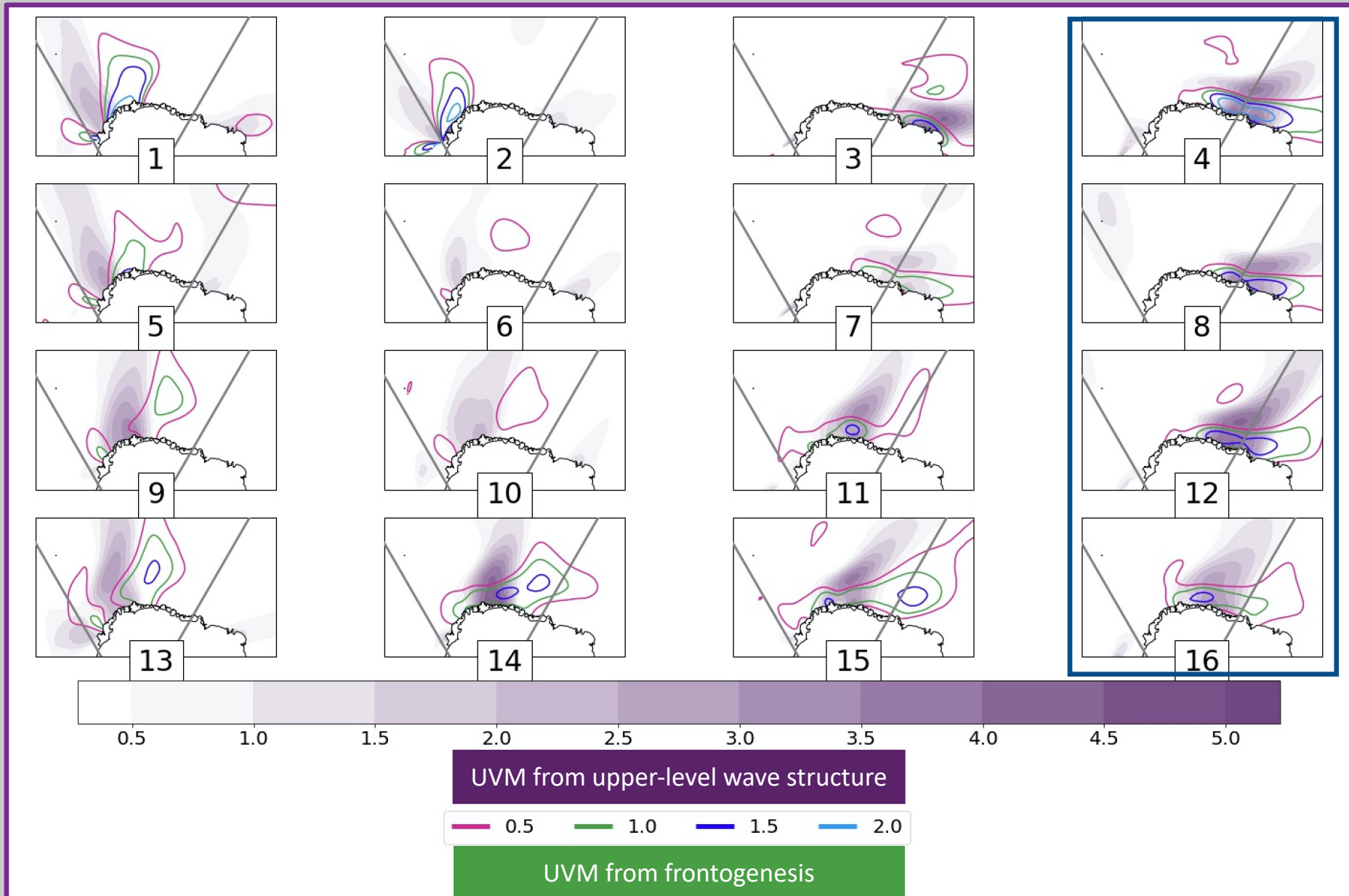
The highest and lowest precipitation nodes do not have the highest and lowest IWV



Atmospheric forcing for upwards motion

upper-level wave structure dominates forcing for UVM

some high precipitation nodes have spatially co–located forcing



What mechanisms drive AR precipitation?

Synoptic drivers common to all nodes

H/L	low high-pressure couplet
	Available moisture
Q_N	Forcing for upwards motion from frontogenesis

that do not explain variability in node precipitation

Synoptic drivers common to all nodes that **also** explain variability in node precipitation

Q_S	Forcing for upwards motion from upper-level wave	42%
QG	Overlap of forcing for upwards motion from Q_S and Q_N	26%

OSPP Participant:

Thank you!

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Synoptic drivers common to all nodes

- H/L — low high pressure couplet
- Available moisture
- Q_N — Forcing for upwards motion from frontogenesis

that do not explain variability in node precipitation

Synoptic drivers common to all nodes that **also** explain variability in node precipitation

- Q_S — Forcing for upwards motion from upper level wave — 42%
- QG — Overlap of forcing for upwards motion from Q_S and Q_N — 26%