PACIFIC AND DRAKE PASSAGE MOVIE INTERPRETATIONS

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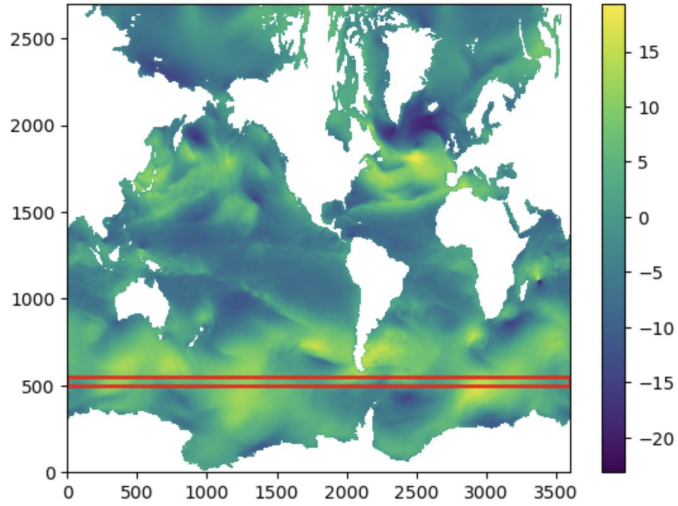
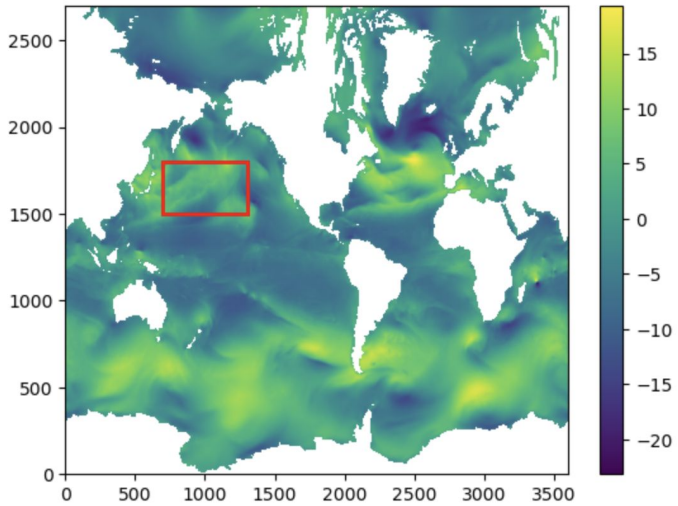
Regions



Drake Passage
(just region b/n South America and Antarctic Peninsula)

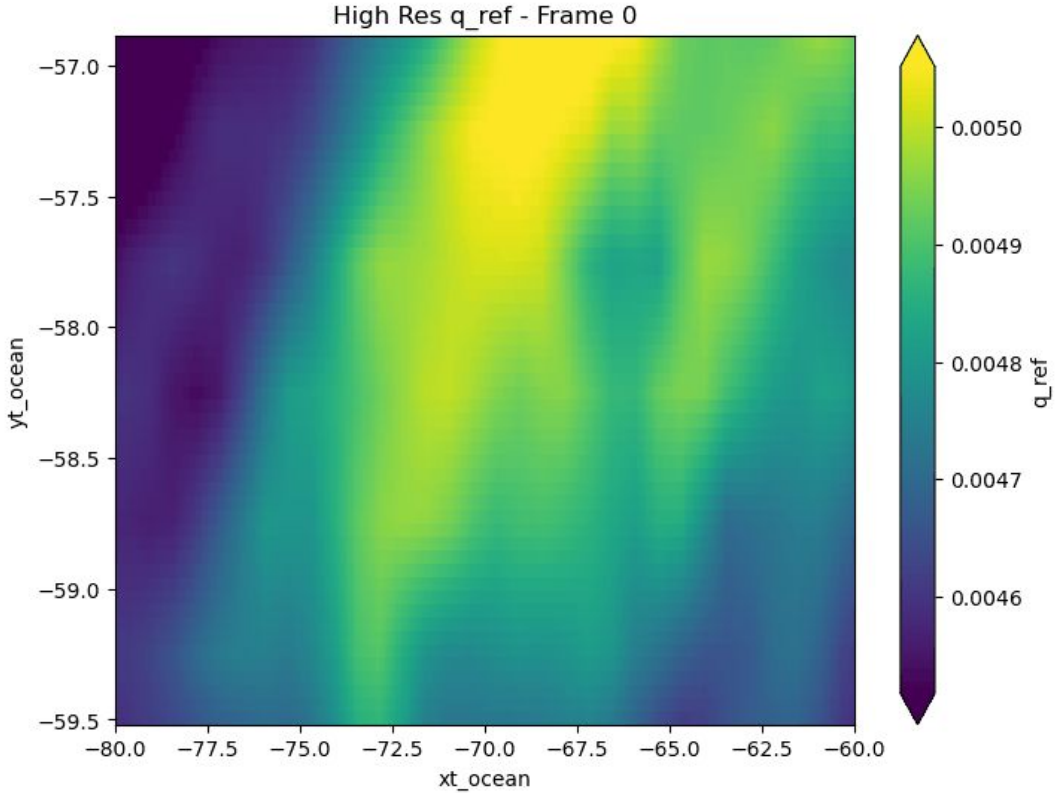


North Pacific

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

DRAKE PASSAGE REGION

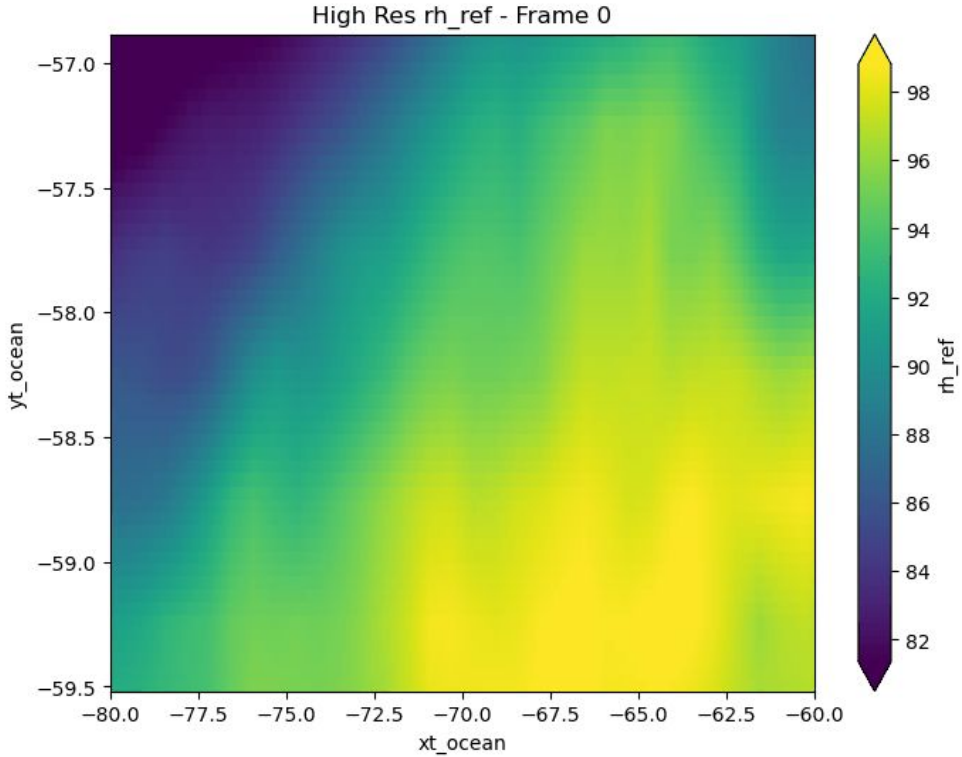
Drake Passage – Specific Humidity at Reference Height of 2m



- Seems to be lower in the south, and higher in the north
  - Makes sense, since colder air has a harder time holding moisture
- Perhaps colder air is coming up from the south?
- Behavior doesn't seem as chaotic as for RH ← maybe storms don't affect SH as much?

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

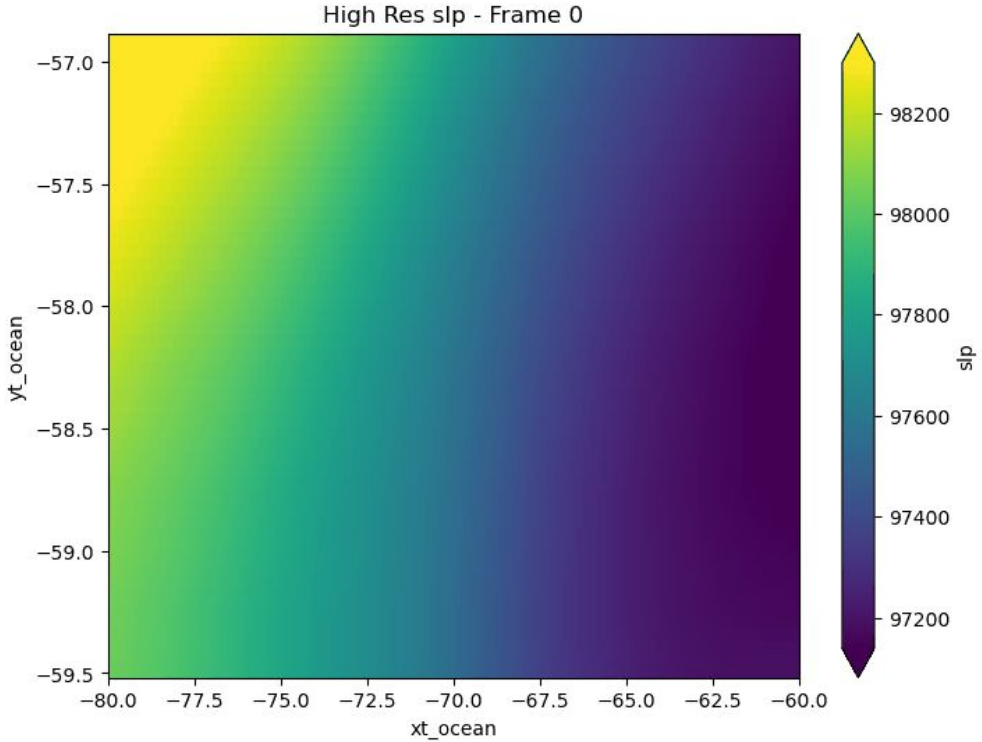
Drake Passage – Relative Humidity at Reference Height of 2m



- RH may be close to saturation, since the reference height is so close to the sea surface
- The pattern of low and high RH seems somewhat chaotic, could this be due to storms?
  - Storms would increase/decrease RH

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

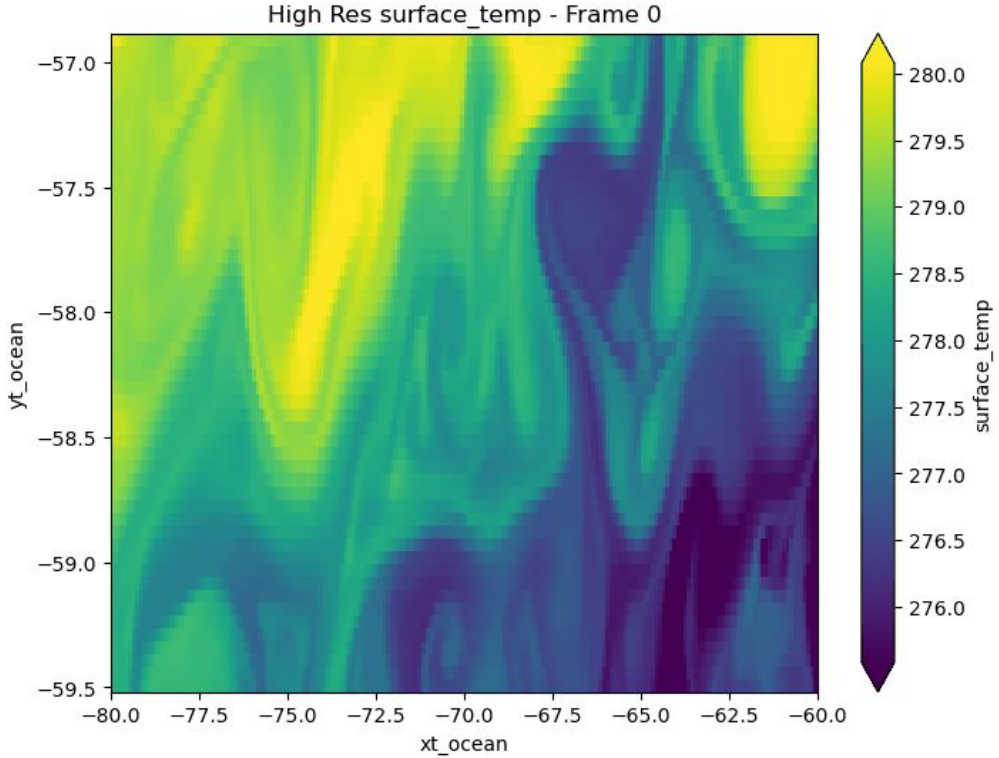
Drake Passage – Sea Level Pressure



- Some interplay between low and high pressure air masses
- Low pressure seems to be coming from southwest
  - Perhaps due to low pressure zone west of Antarctic Peninsula (Amundsen-Bellingshausen Sea Low)

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

Drake Passage – Sea Surface Temperature



- Cold water from the Southern Ocean
- Warmer water from southern Atlantic and Pacific
- Both water masses are mixing
- Lots of mixing in Drake Passage → very sharp gradients in movie
- Tongues of cold water coming southward, and tongues of warm water going upward

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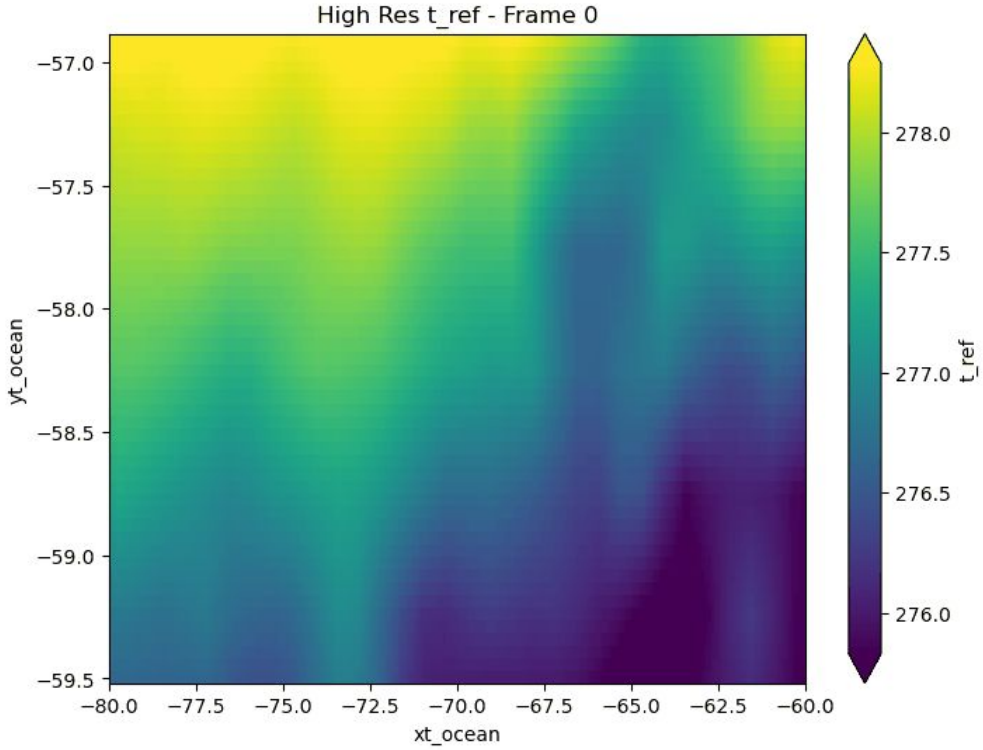
Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

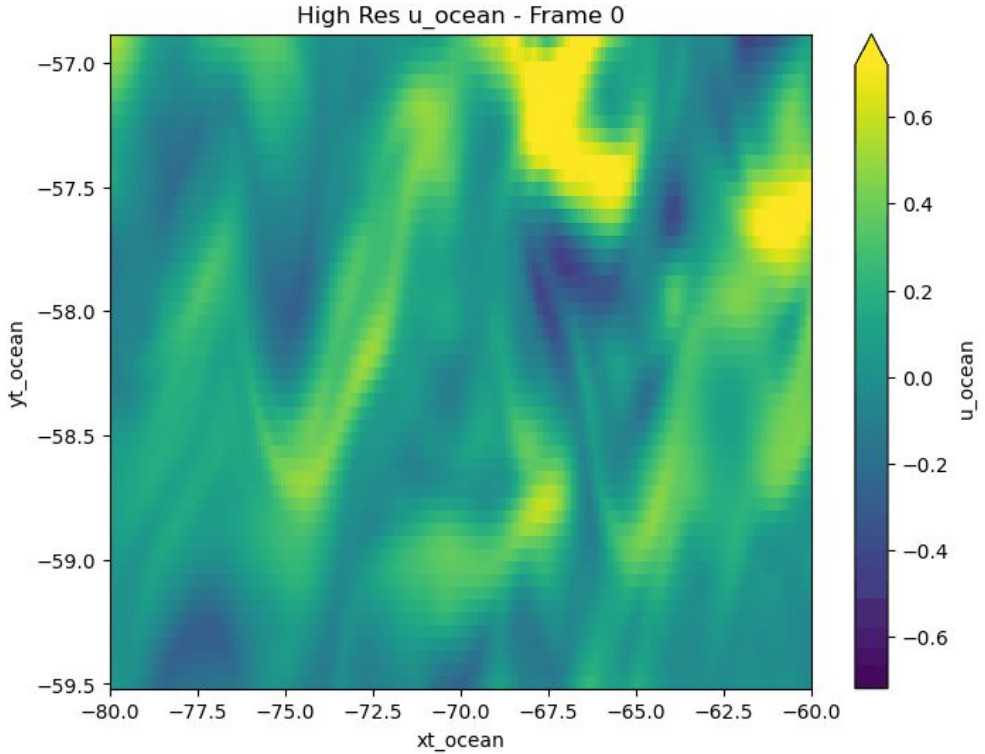
Drake Passage – Temperature at Reference Height of 2m



- Cold air encroaching from the South
  - Could this be due to winter?
- Westerly winds? (from west to east)

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

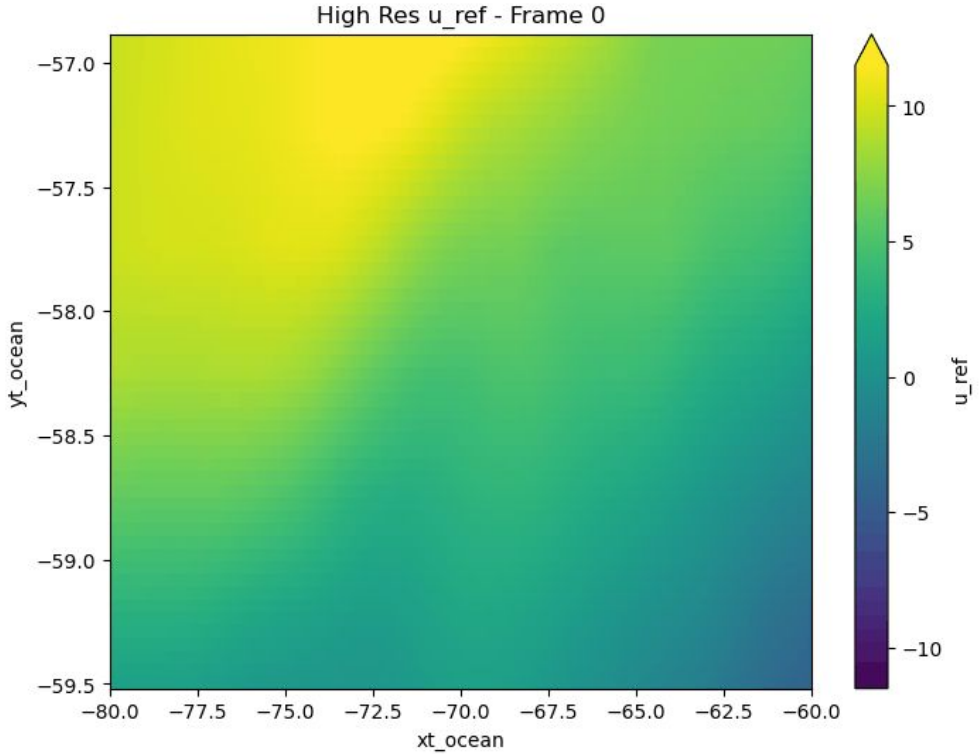
Drake Passage – Zonal Ocean Velocity



- Dominant eastward flow, which is consistent with the clockwise Antarctic Circumpolar Current
- Larger zonal velocities seem to occur in eddies
- Flow is more laminar than turbulent

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

Drake Passage – Zonal Reference Velocity at Height 2m



- Dominant eastward flow, which aligns with the behavior of westerlies in the region
- The gradients in the horizontal direction vary in sharpness
- There is some chaos in the flow, so determining where exactly certain air masses come from isn't easy

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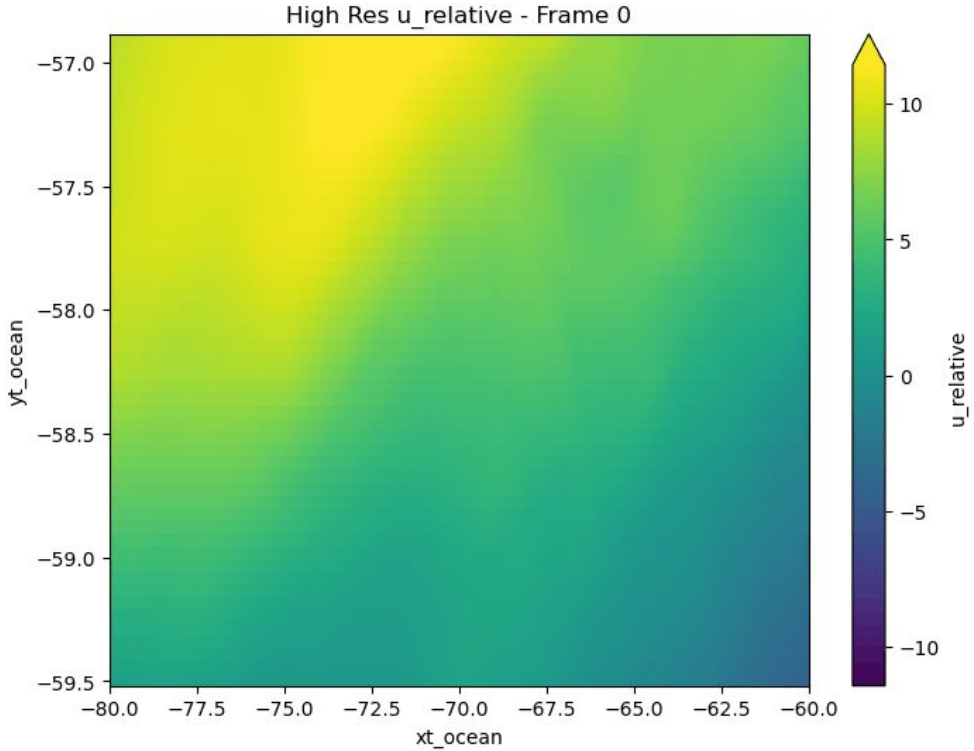
Drake Passage – Zonal Relative Velocity



- Movement is relatively eastward, which aligns with westerly and ACC behavior
- At certain time points it is possible to see the ocean eddies
  - Depends on relative magnitude of atmospheric versus ocean zonal speeds
- Atmospheric behavior occurs at much larger scales

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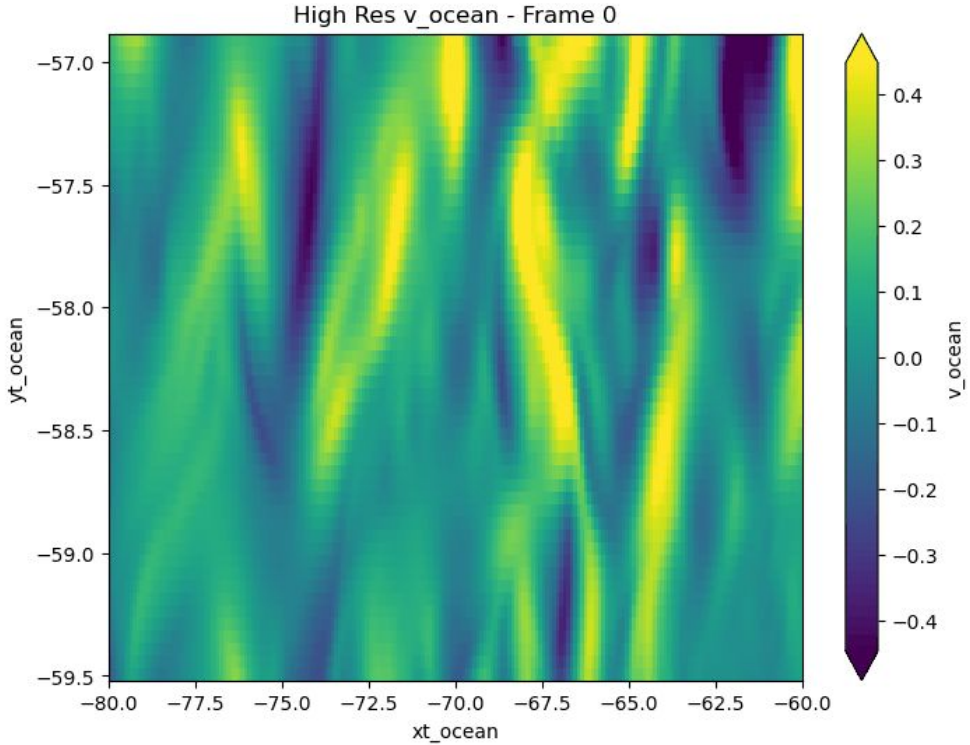
Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

Drake Passage – Meridional Ocean Velocity



- There is no dominant flow in a particular direction
- Some tongues move vertically north or south at large velocity magnitudes
- Horizontal gradients are quite large, but vertical gradients are pretty small

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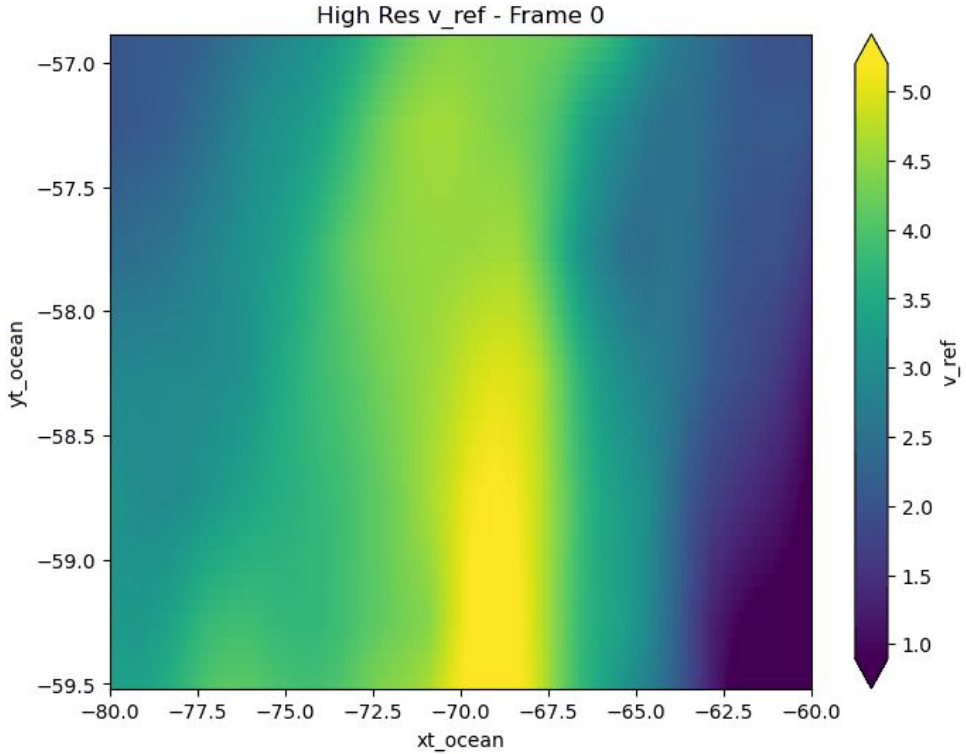
Drake Passage – Meridional Reference Velocity at Height 2m



- Movement is relatively zonal
- Sharper gradients in the zonal than the meridional direction
- Seems like cold air may be coming up from the south
- Meridional winds are smaller in magnitude than zonal winds

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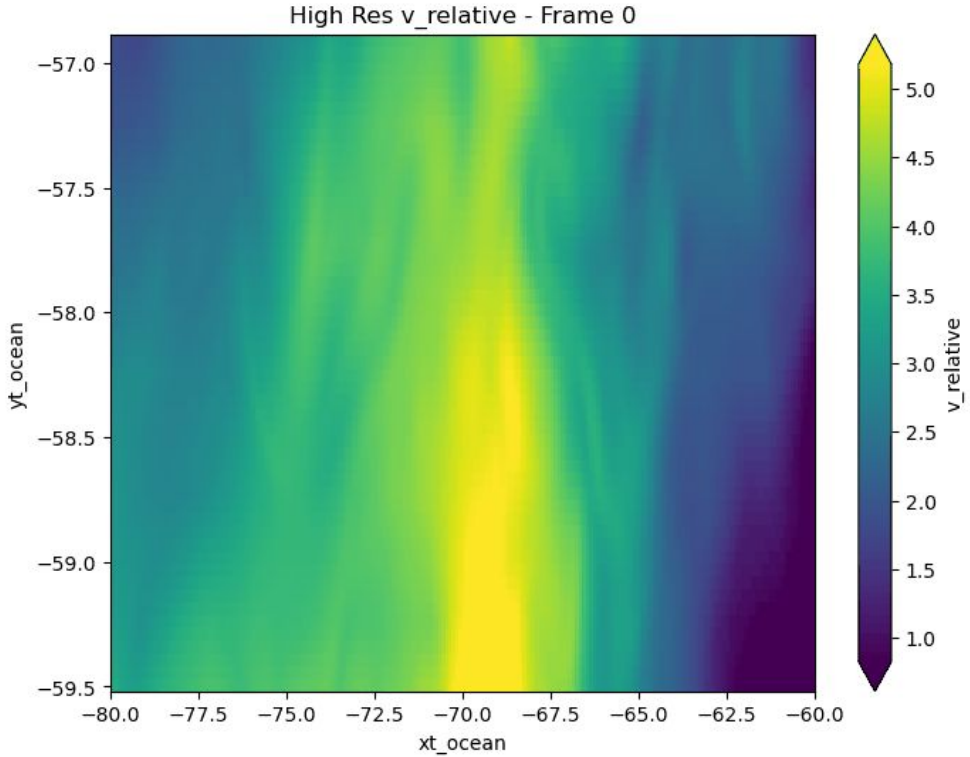
Drake Passage – Meridional Relative Velocity



- For some snapshots, it is possible to see the ocean eddies
  - Depends on relative magnitude of atmospheric versus ocean meridional speeds
- Atmospheric behavior occurs at much larger scales than oceanic behavior

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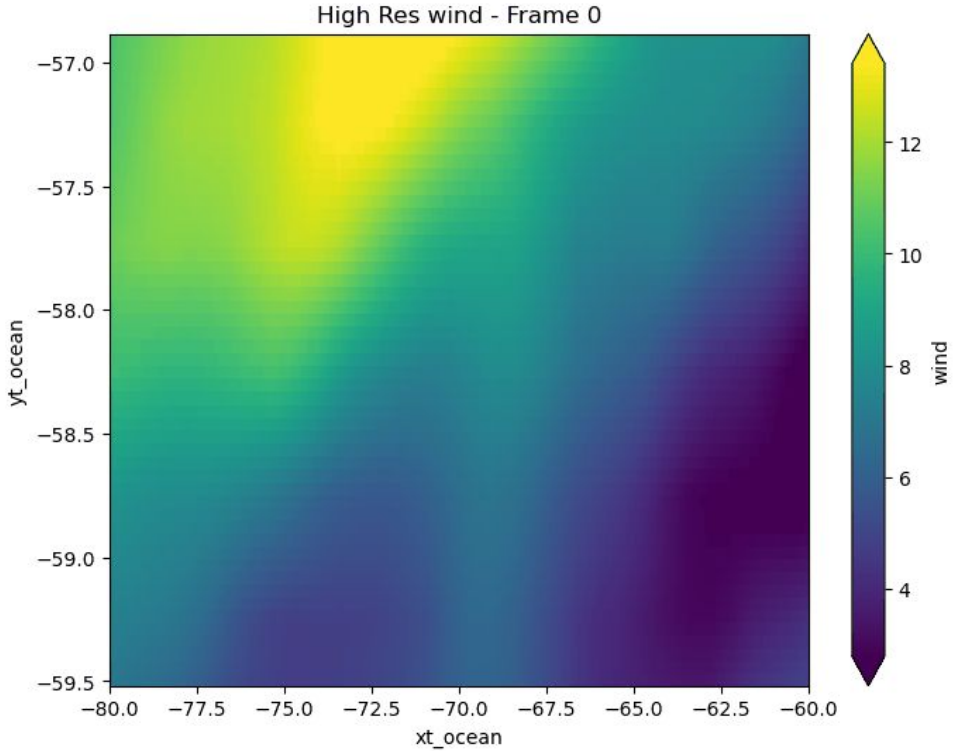
Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

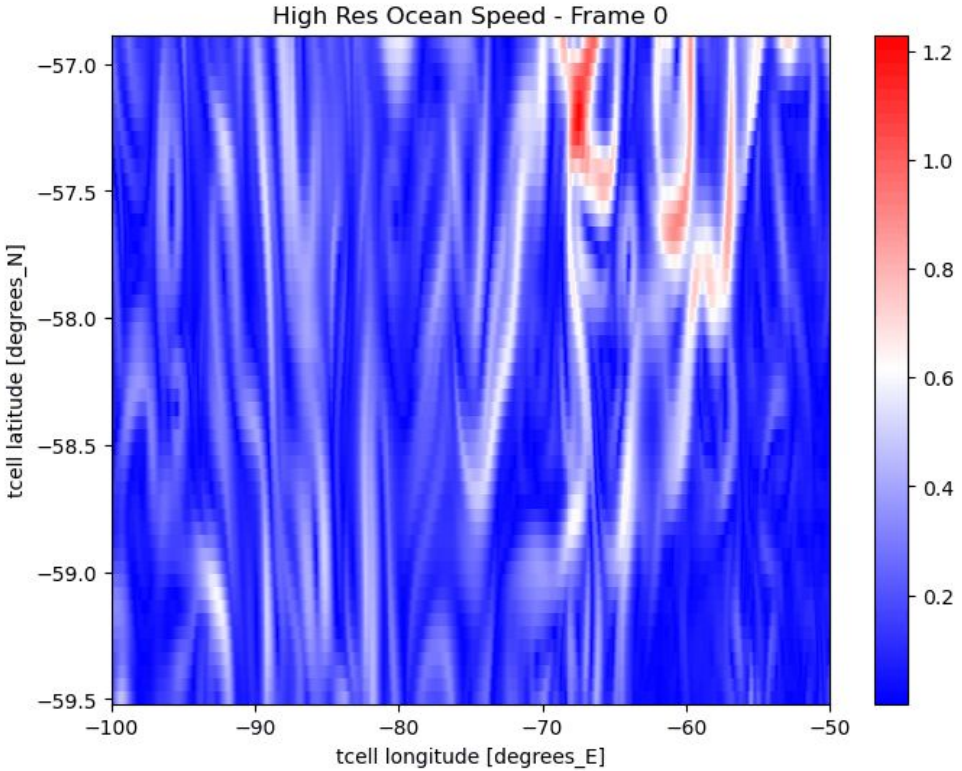
Drake Passage – Wind



- Winds are moving mostly eastward, which is consistent with the behavior of westerlies
- Gradients typically don't seem sharp in the vertical or horizontal direction
- There is some variability in winds
  - Could be due to storms, since the Drake Passage is a storm corridor

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

Drake Passage – Ocean Speed

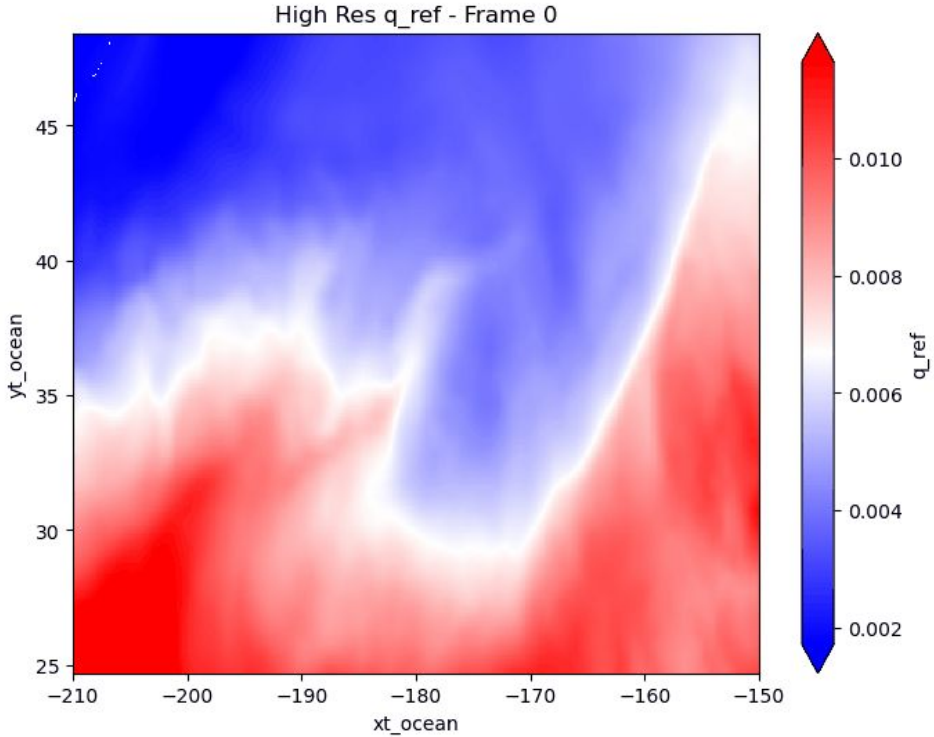


- Lots of meandering, meaning significant vorticity values
- Larger speeds are in the eddies
  - Largest speed in eddies on the top right side

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

NORTH PACIFIC REGION

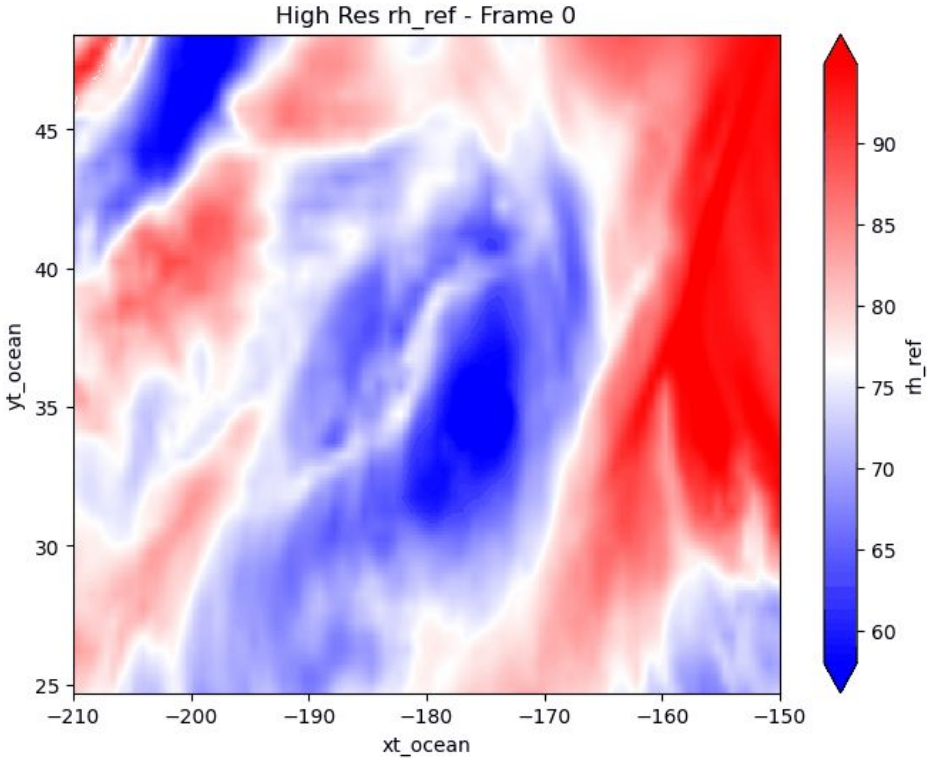
Pacific Ocean – Specific Humidity at Reference Height of 2m



- Very clear division between high and low specific humidity regions
- SH fronts are moving eastward
- The boundary b/n low and high SH seems to roll eastward too
- Could colder air be coming from Japan and warmer air from the south?

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

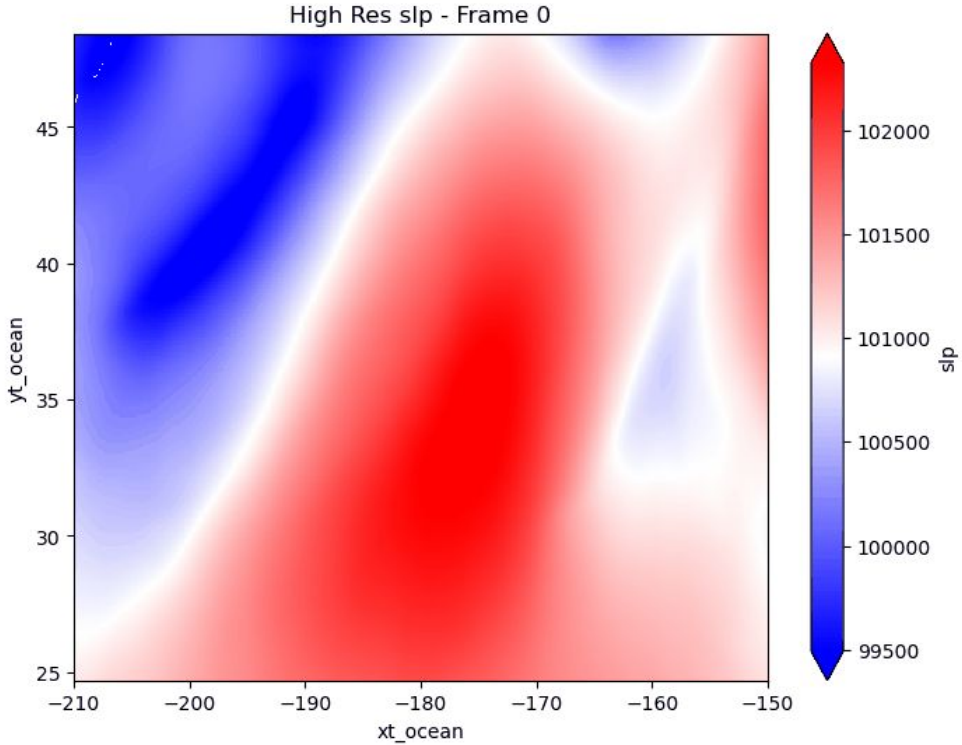
Pacific Ocean – Relative Humidity at Reference Height of 2m



- Air masses with different RHs are moving eastward
- No spatial split b/n high and low RH, like for SH
- Maybe higher RH masses correspond to warmer ocean air from the ocean, and lower RH masses correspond to drier air from inland?

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

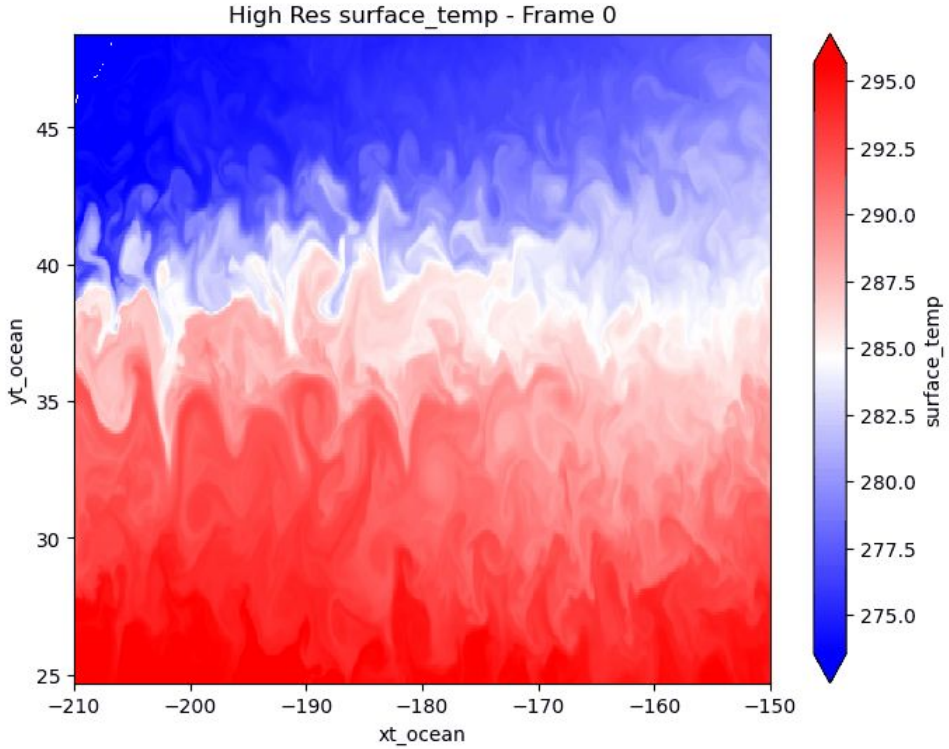
Pacific Ocean – Sea Level Pressure



- Spatial split b/n high and low sea level pressure → lower in the north and higher in the south
- Low pressure systems tend to move across the north Pacific in the winter
  - Could these low pressure patches by storms?

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

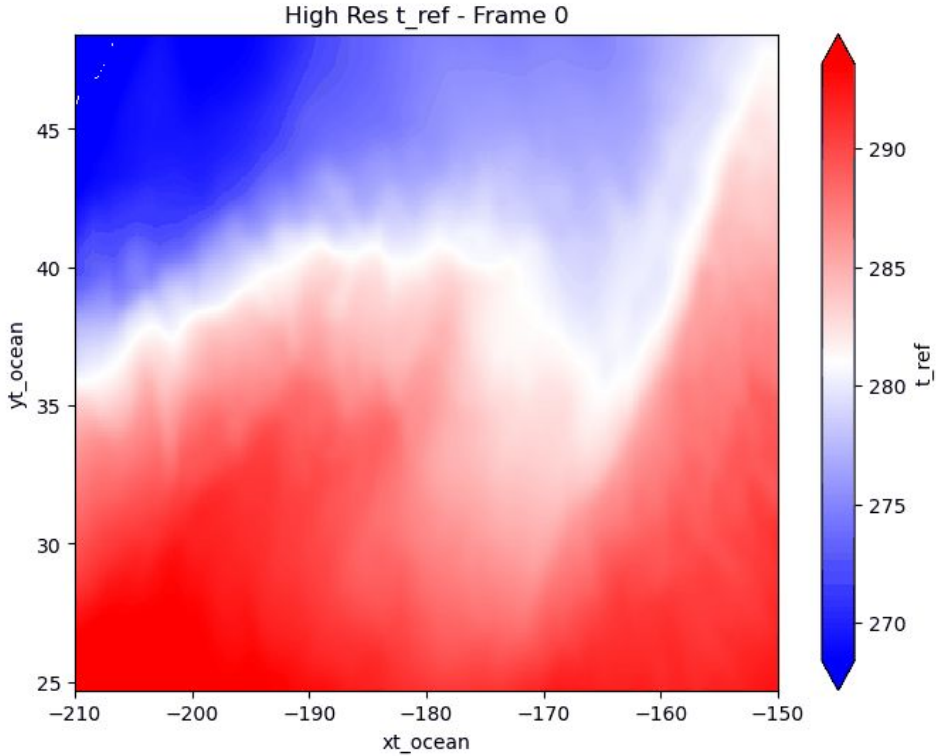
Pacific Ocean – Sea Surface Temperature



- Spatial split b/n high and low sea surface temperature → lower in the north and higher in the south
- Eddies are mixing water masses of different temperatures in the middle
- Cold tongue on left → Kuroshio Current

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

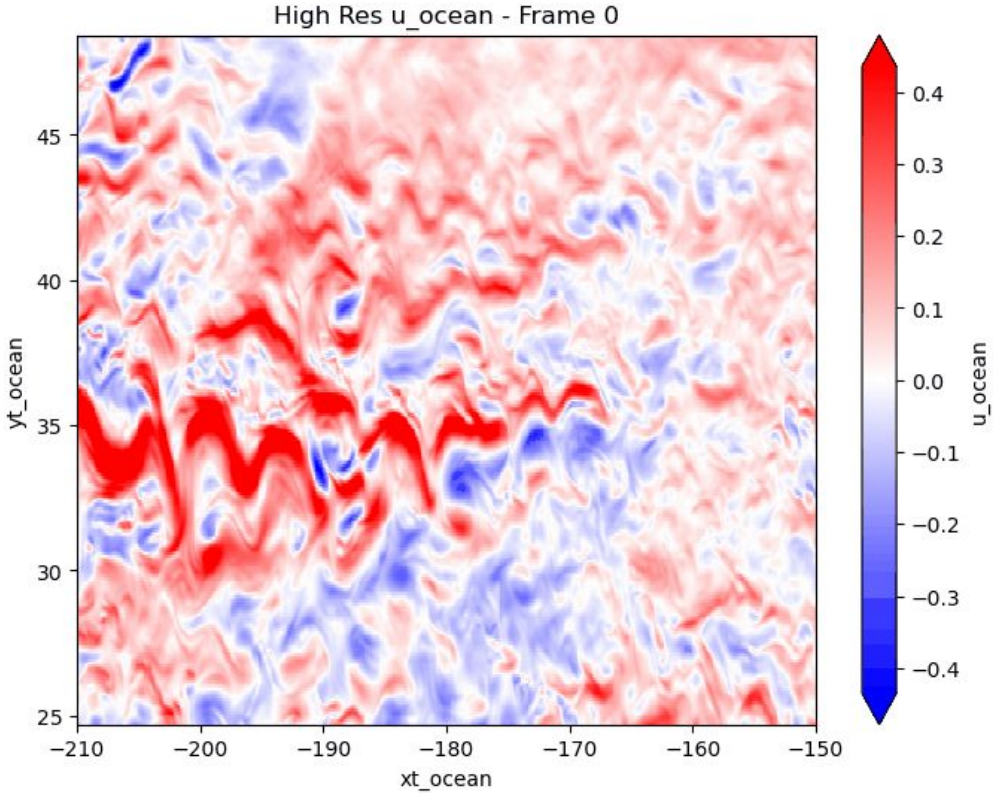
Pacific Ocean – Temperature at Reference Height of 2m



- Spatial split b/n high and low temperature → lower in the north and higher in the south
- Primarily zonal movement of air masses
  - Seeing mostly eastward motion of air masses

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

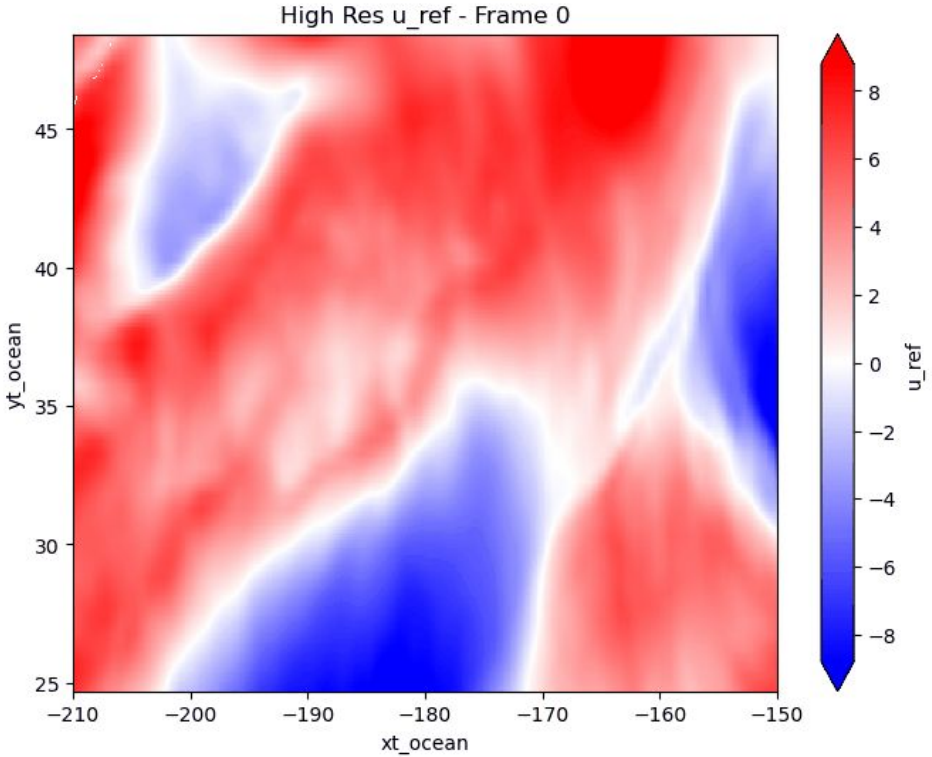
Pacific Ocean – Zonal Ocean Velocity



- Much smaller scales for oceanic processes than atmospheric processes
- Mostly eastward movement of flows
- A few westward chunks show up, but these are within eddy formations, so have to do with eddies being present, rather macroscopic flow movement
- Not too turbulent

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

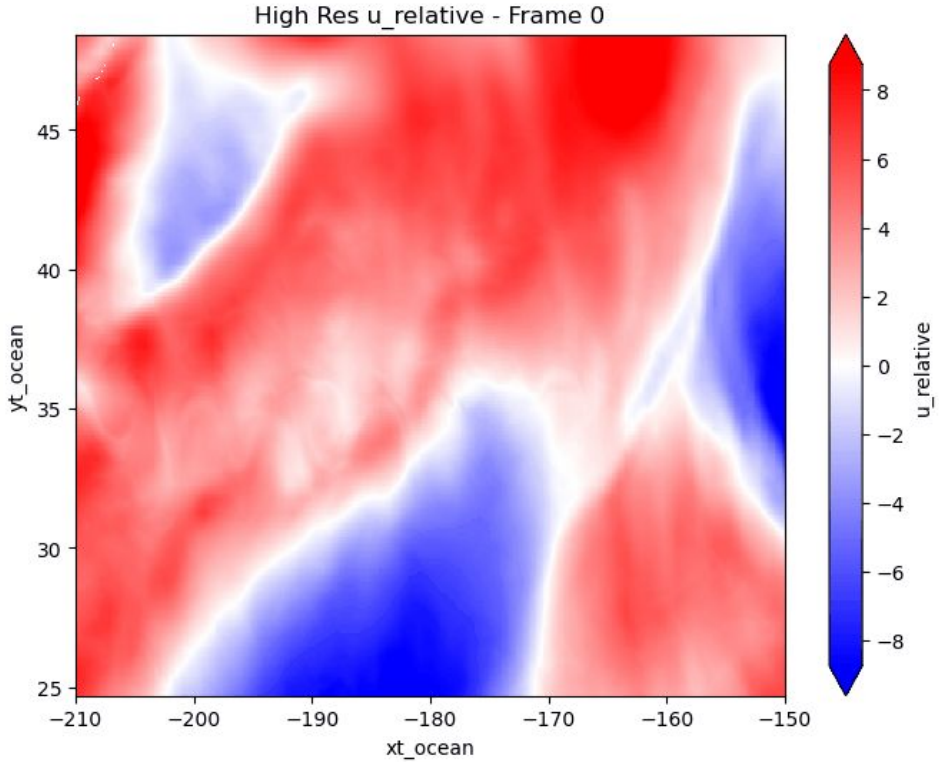
Pacific Ocean – Zonal Reference Velocity at Height 2m



- Much larger scales for atmospheric zonal ocean velocity than for oceanic
- Mostly eastward movement, with some westward bits on north and south edges of the frame
- Much larger magnitudes for atmosphere than ocean

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

Pacific Ocean – Zonal Relative Velocity



- Clearly, the atmospheric zonal flows are dominating in this image, due to their large magnitude
  - Could the atmospheric zonal flows be forcing the oceanic zonal flow?
- Mostly eastward movement, especially in the middle of the frame

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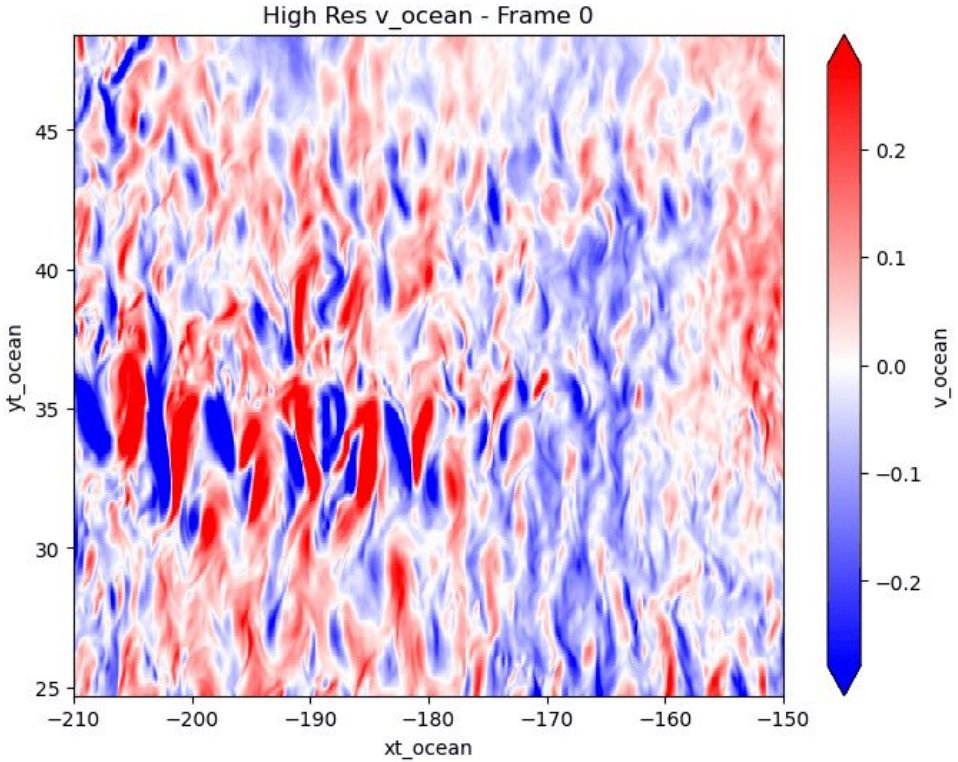
Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

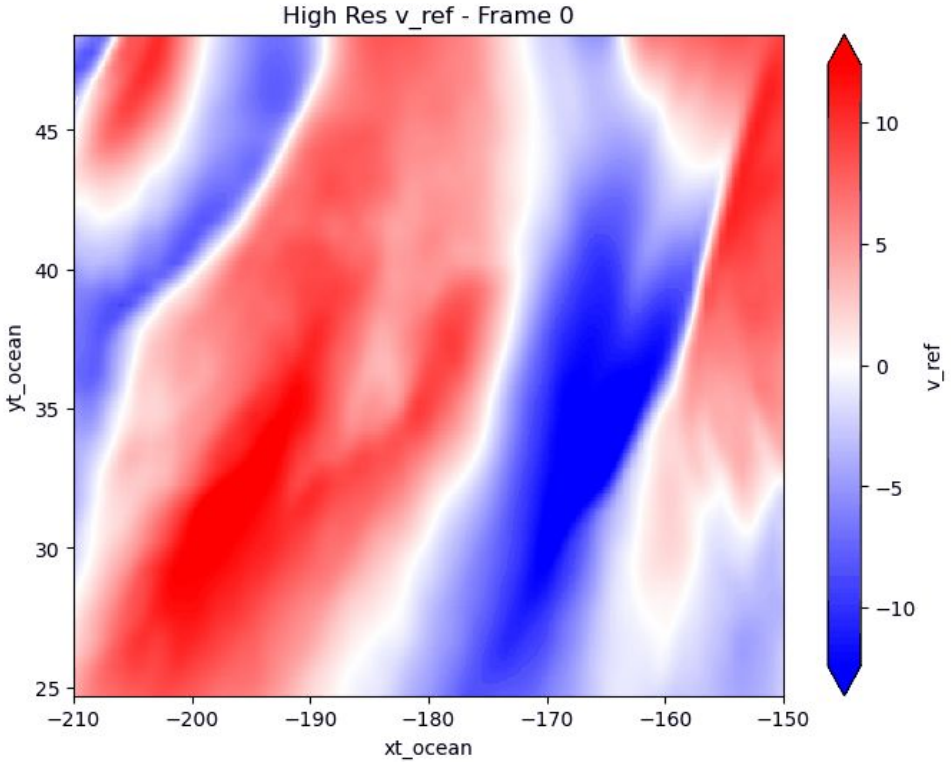
Pacific Ocean – Meridional Ocean Velocity



- Very small scales, compared to atmospheric motion
- Northward and southward vertical bits, but no general northward or southward flows
- Much steeper gradients in the zonal direction than the meridional direction
- Some eastward movement of background net northward and southward flows?

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

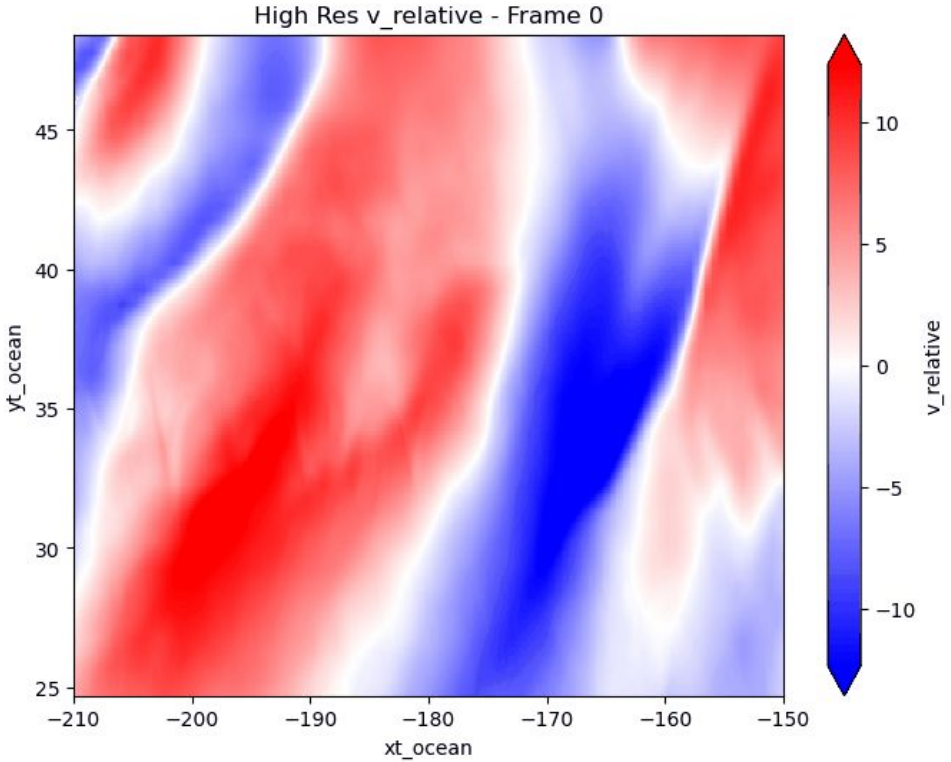
Pacific Ocean – Meridional Reference Velocity at Height 2m



- Much larger scales for atmospheric meridional ocean velocity than for oceanic
- Eastward movement of air masses moving northward or southward with large velocities
- Alternate air masses of strong northward and strong southward flows

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

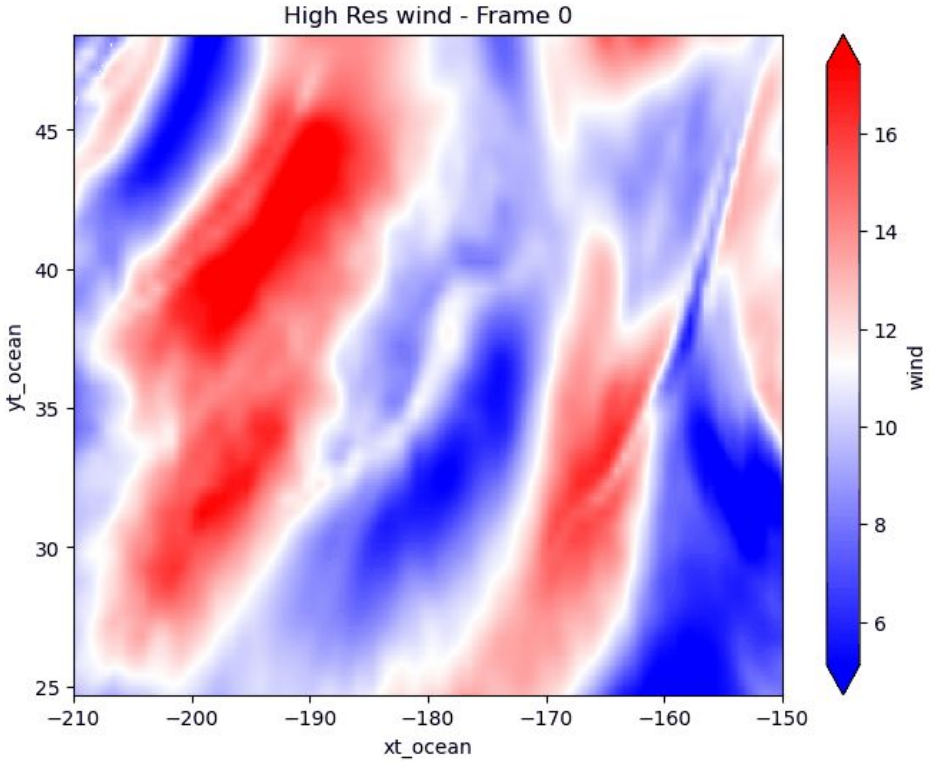
Pacific Ocean – Meridional Relative Velocity



- Atmospheric meridional motion is dominating ← much larger scales for atmospheric meridional ocean velocity than for oceanic
- Eastward movement of masses with strong northward or southward flow
- The atmospheric motion could be forcing the eastward ocean movement?

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

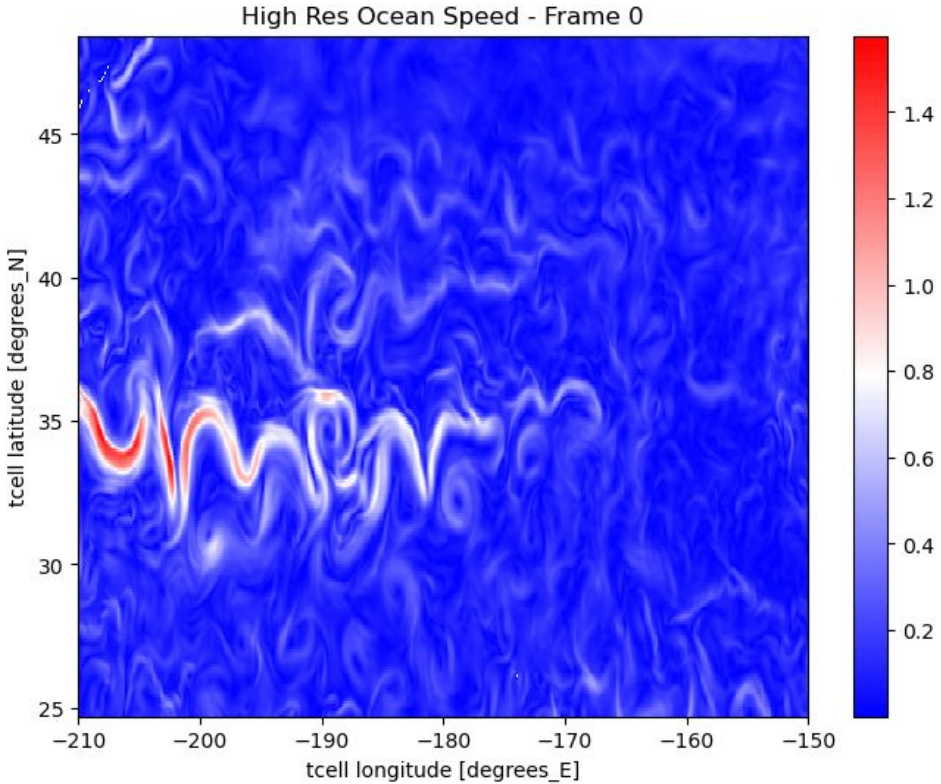
Pacific Ocean – Wind



- Generally eastern, slightly northeastern, flow
- Alternation of air masses with very large and small speeds
  - These air masses all move eastward or northeastward

Figure: https://www.google.com/url?q=https://www.pmel.noaa.gov/ocs/sites/default/files/thumbnails/image/5R_AirSeaFluxes_RSidebar.jpg&sa=D&source=editors&ust=1728594863256514&usg=AOvVaw1eAeCEIg21D31jTGwyAVb1

Pacific Ocean – Ocean Speed



- Overall eastward flow
- Generally low magnitudes, but very high magnitudes along a eastward stream in the middle