

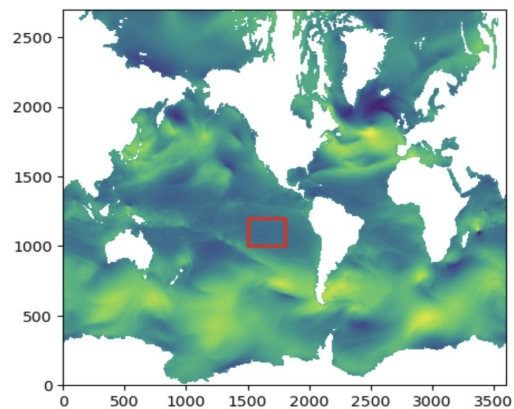
AIR-SEA FLUX MOVIE INTERPRETATIONS

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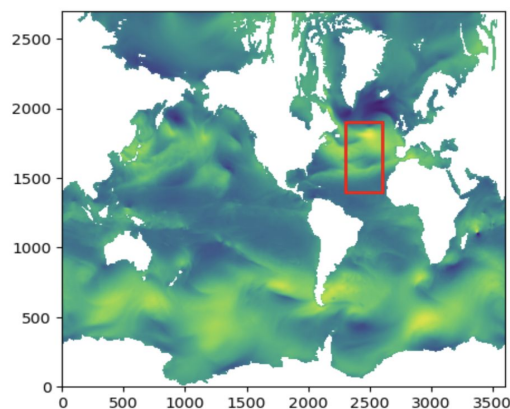


LEAP

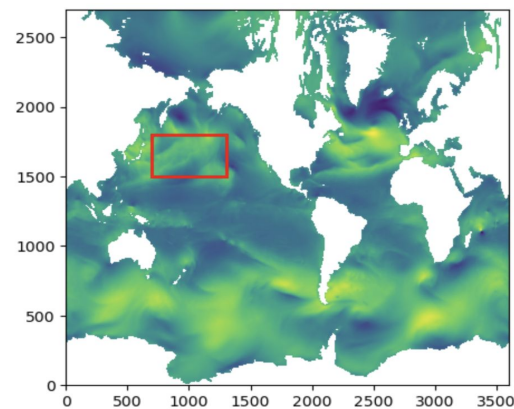
Regions



East Pacific



Gulf Stream



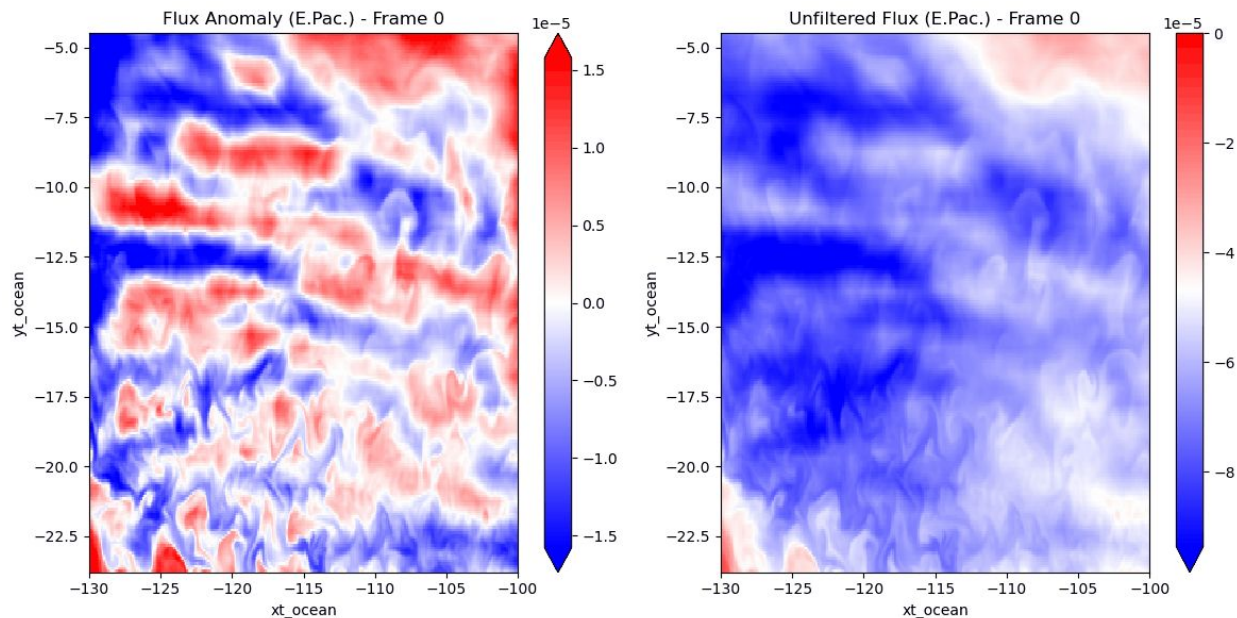
North Pacific

EAST PACIFIC REGION



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East Pacific – Freshwater Flux Anomaly (unfiltered - filter scale 50)

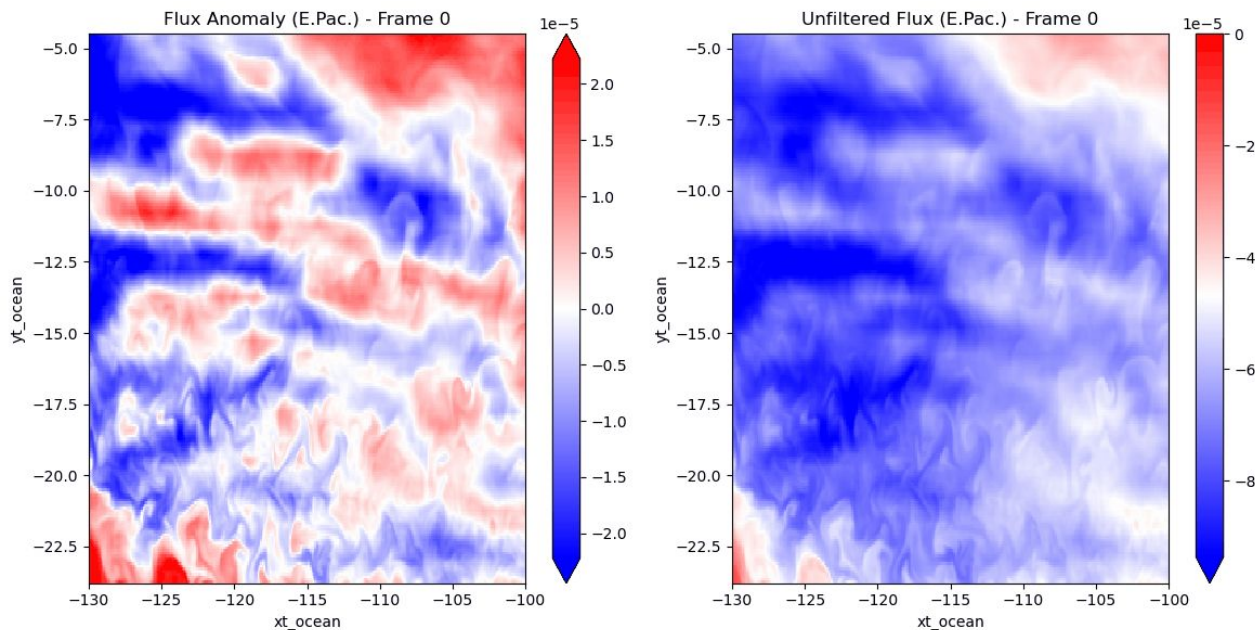


- Westward movement of freshwater flux patterns for the all-scale maps and the anomaly maps
- On large scales, freshwater is mostly added to the ocean
- On smaller scales, freshwater is mostly removed from the ocean



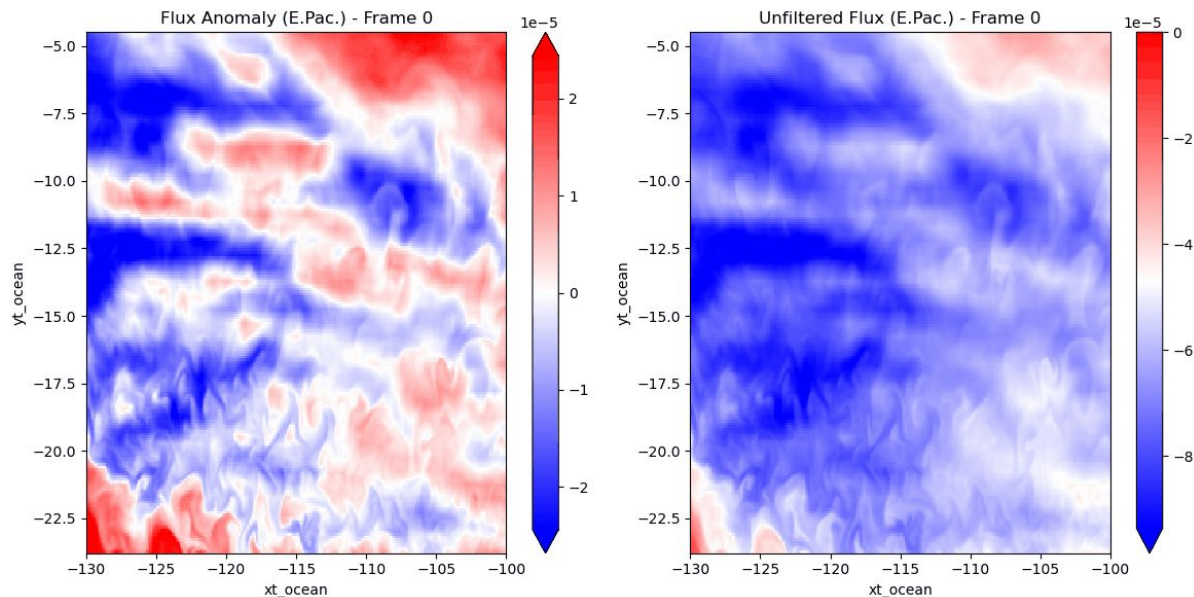
LEAP

East Pacific – Freshwater Flux Anomaly (unfiltered - filter scale 100)



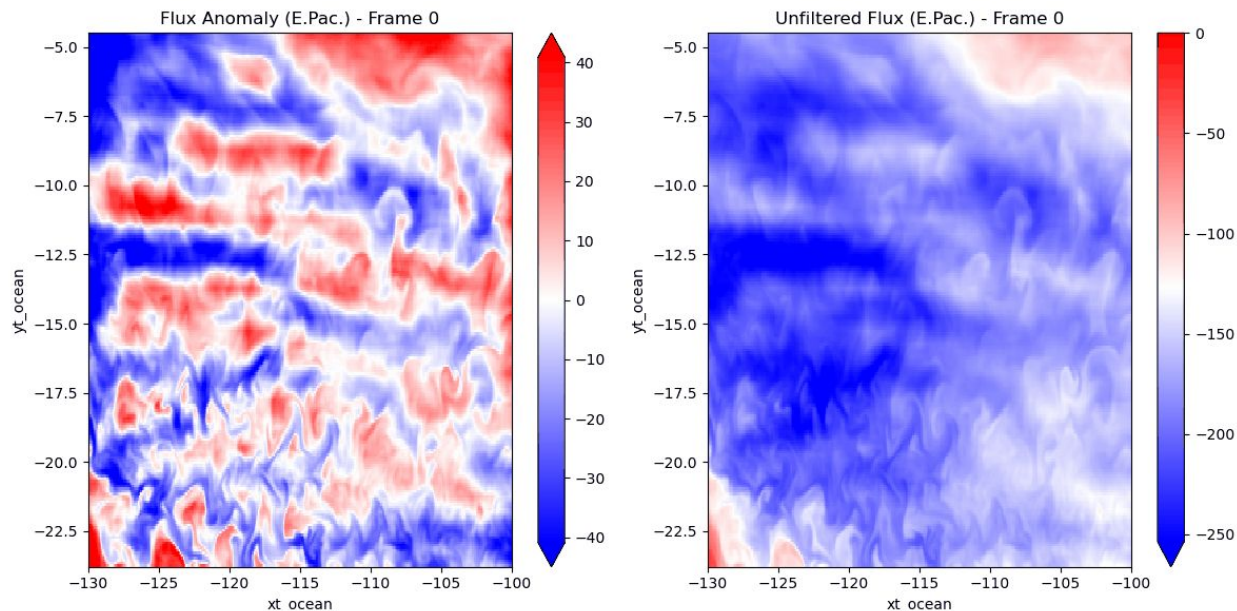
- For the anomaly, the smaller-scale features associated with the the freshwater loss from the ocean are larger for larger filter scales
- This indicates the freshwater addition to the ocean is only occurring on very very large scales

East Pacific – Freshwater Flux Anomaly (unfiltered - filter scale 150)



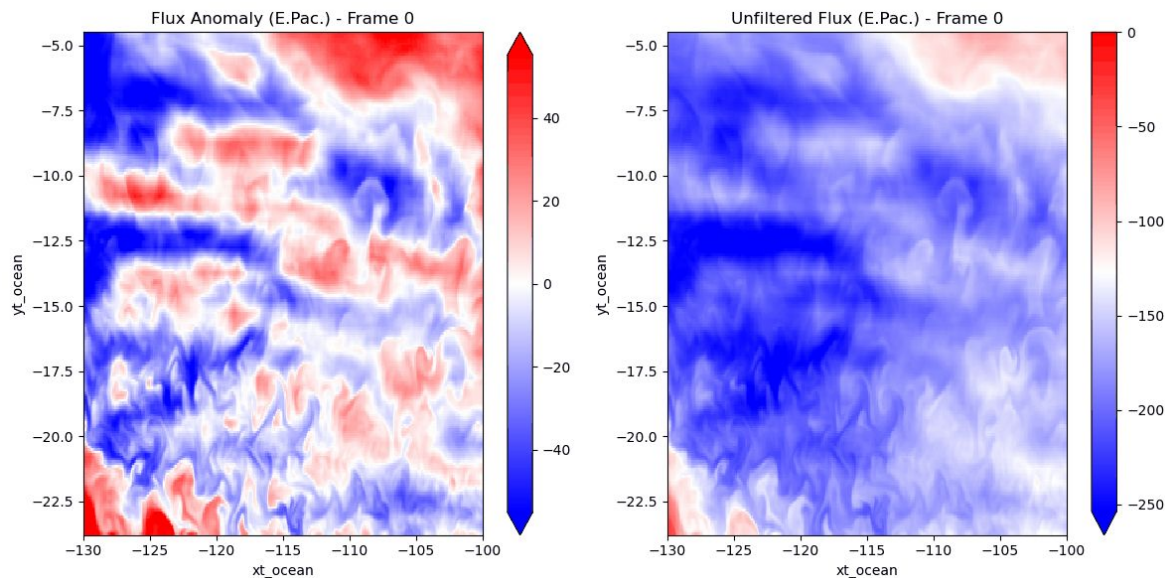
- Primarily westward movement is in line with wind patterns in the region (mostly easterlies)
- Small eddy structures are visible on both anomaly and non-anomaly maps
 - Does this mean the eddies play a significant role even in our all-scale maps?

East Pacific – Heat Flux Anomaly (unfiltered - filter scale 50)



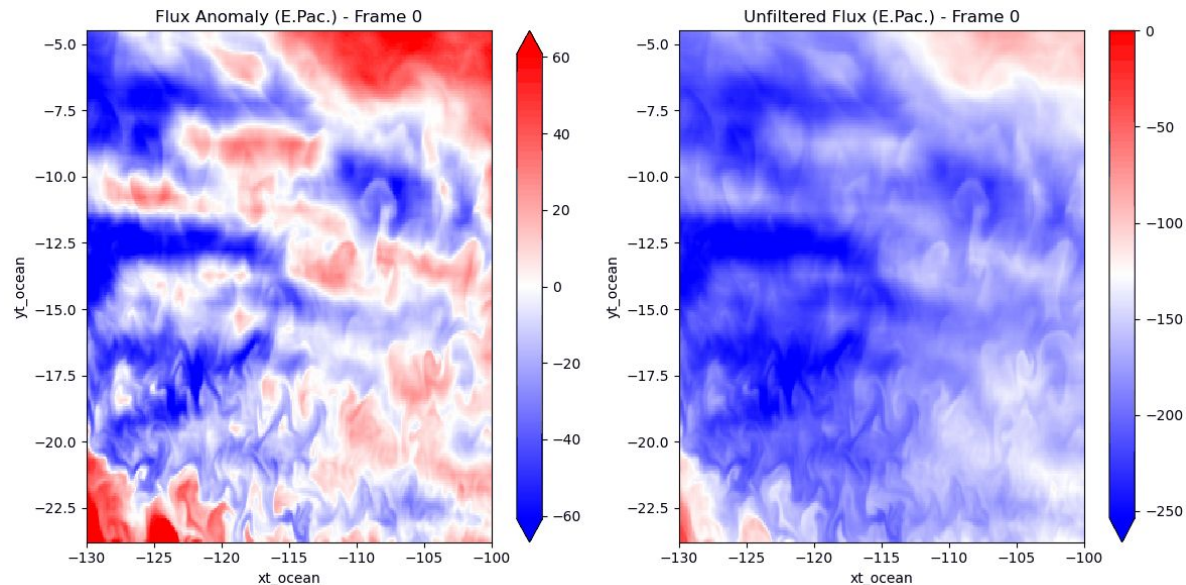
- +ve heat flux indicates heat is being transferred from the atmosphere to the ocean
- -ve heat flux indicates heat is being transferred from the ocean to the atmosphere
- The all-scale map is all negative, so heat is mostly leaving the ocean for the atmosphere

East Pacific – Heat Flux Anomaly (unfiltered - filter scale 100)



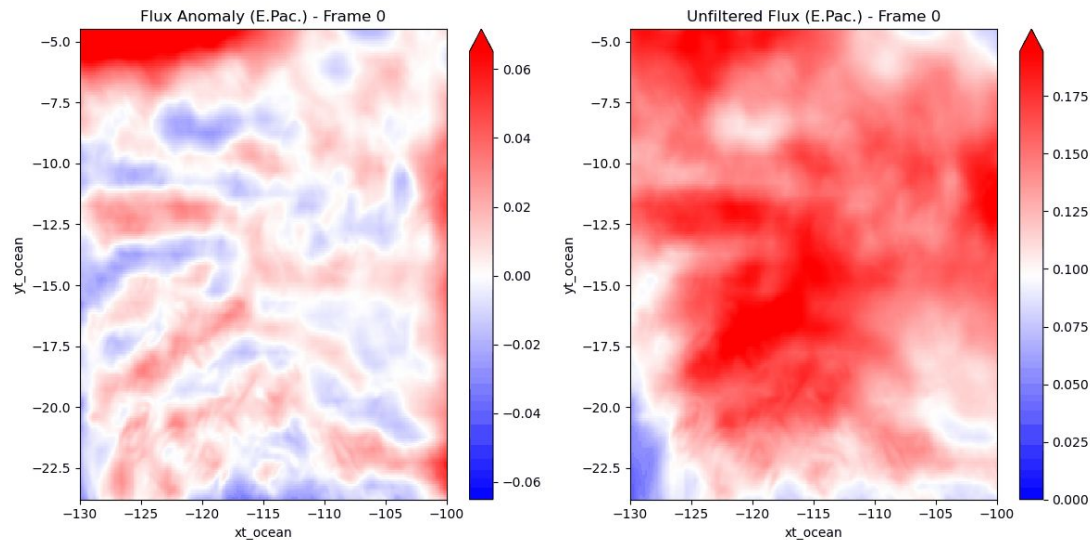
- The flux anomaly maps feature both +ve and -ve heat fluxes
- As the flux anomaly's cutoff scale increases, the flux anomaly maps become closer to the all-scale map

East Pacific – Heat Flux Anomaly (unfiltered - filter scale 150)



- The features in the anomaly map are of slightly smaller scales than what we see on the all-scale map
- The dynamics of both movies match quite closely

East Pacific – Momentum Flux Anomaly (unfiltered - filter scale 50)

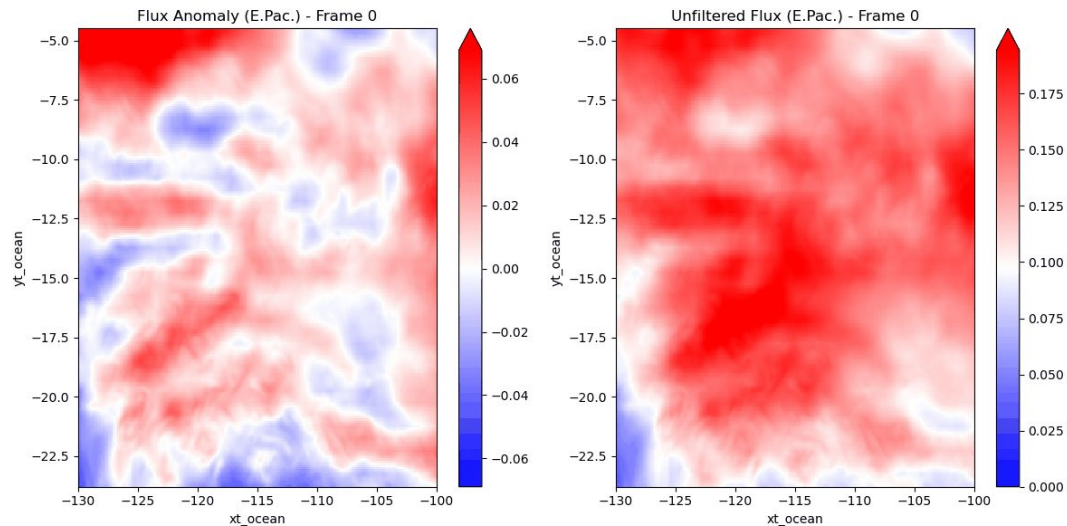


- +ve flux corresponds to momentum transfer from atmosphere to ocean
- -ve flux corresponds to momentum transfer from ocean to atmosphere
- There seems to be no net trend in direction for both maps



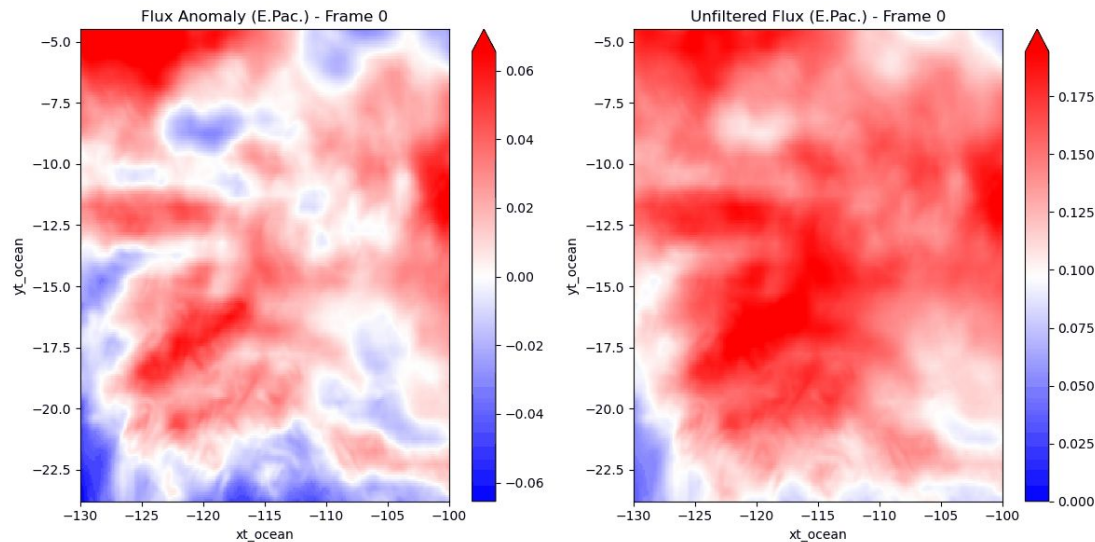
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East Pacific – Momentum Flux Anomaly (unfiltered - filter scale 100)



- Momentum flux seems net +ve for all-scale map, meaning mostly momentum, is transferred from the atmosphere to the ocean mostly → atmosphere is forcing the ocean

East Pacific – Momentum Flux Anomaly (unfiltered - filter scale 150)



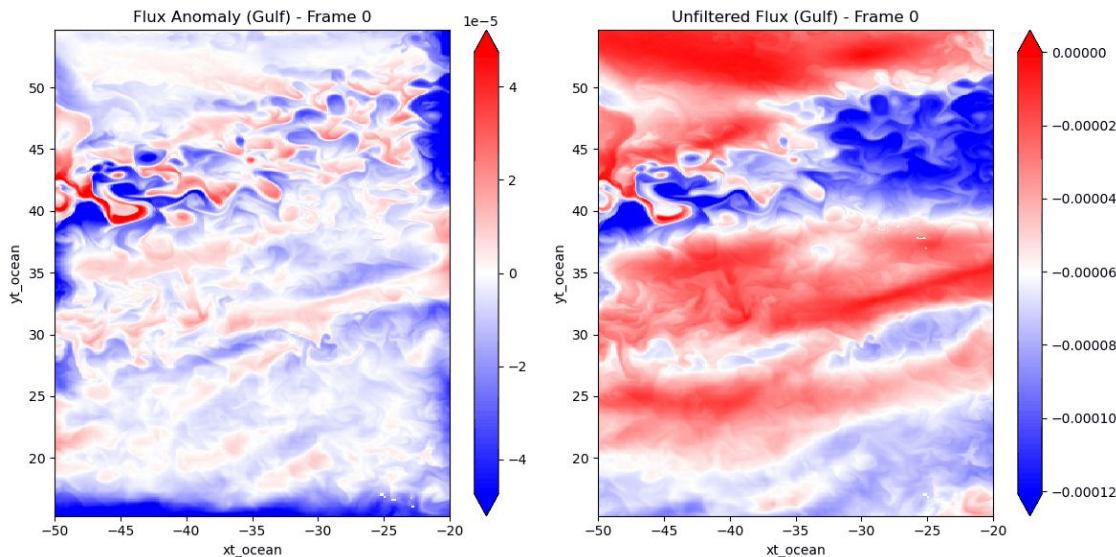
- Generally, more variability on smaller scales (as seen by the flux anomaly maps), than on larger scales
- Thus, forcing from the ocean to the atmosphere only occurs on small scales

GULF STREAM REGION



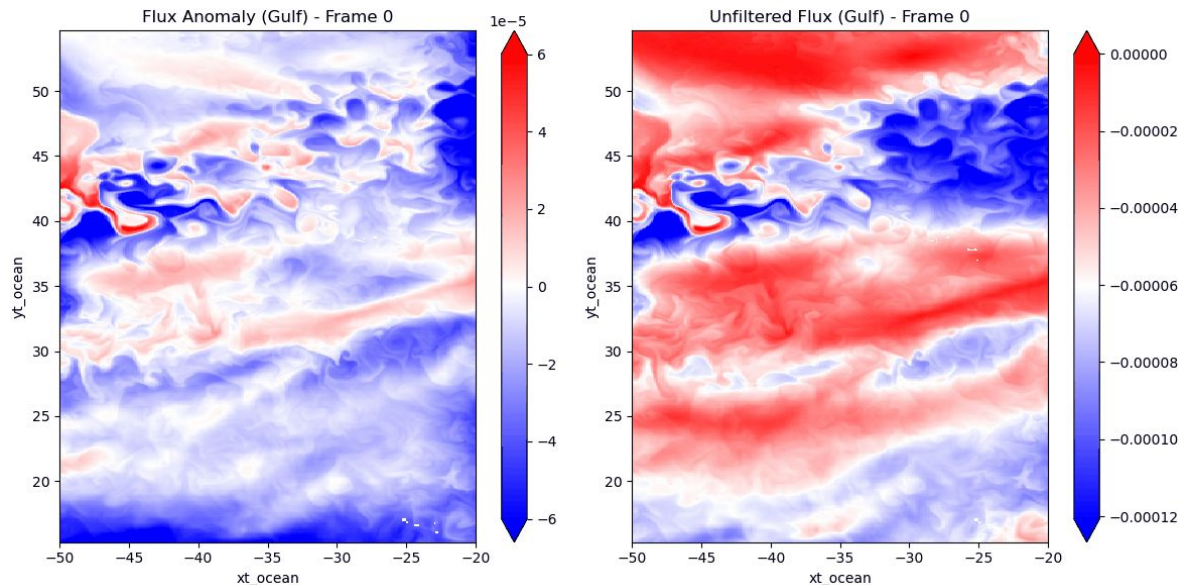
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Gulf Stream – Freshwater Flux Anomaly (unfiltered - filter scale 50)



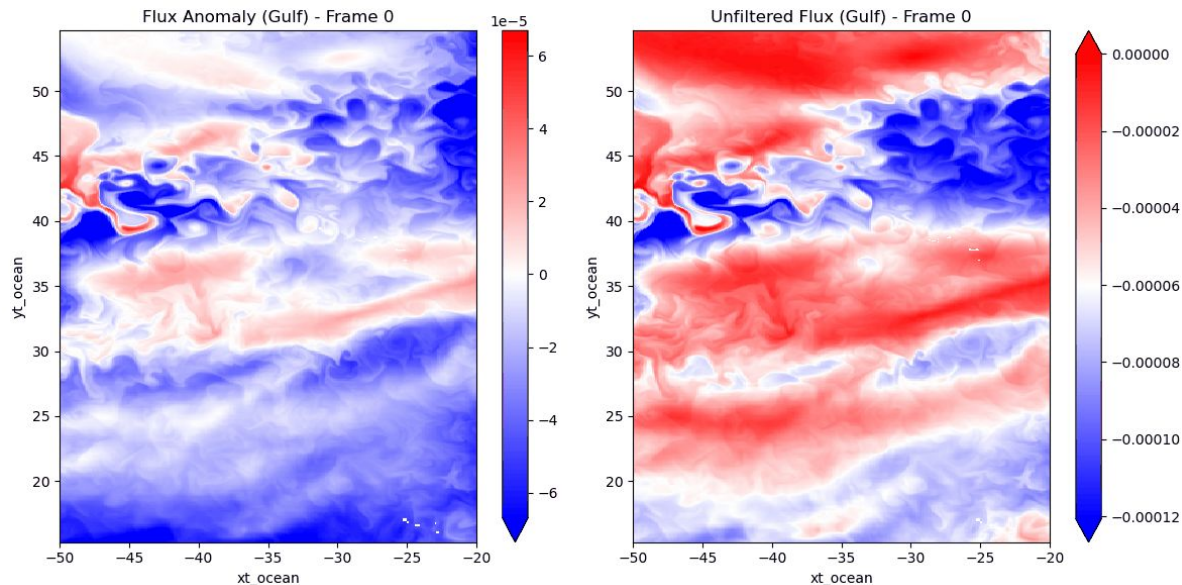
- Large chunks of the map are dominated by freshwater being lost from the ocean, but these chunks move eastward, and there seem to be some large locations where freshwater is added to the ocean
- Background eastward flow in anomaly map

Gulf Stream – Freshwater Flux Anomaly (unfiltered - filter scale 100)



- Background eastern flow of freshwater being lost from the ocean, even visible in the anomaly map
- Some eddy structures can be seen on the anomaly map

Gulf Stream – Freshwater Flux Anomaly (unfiltered - filter scale 150)

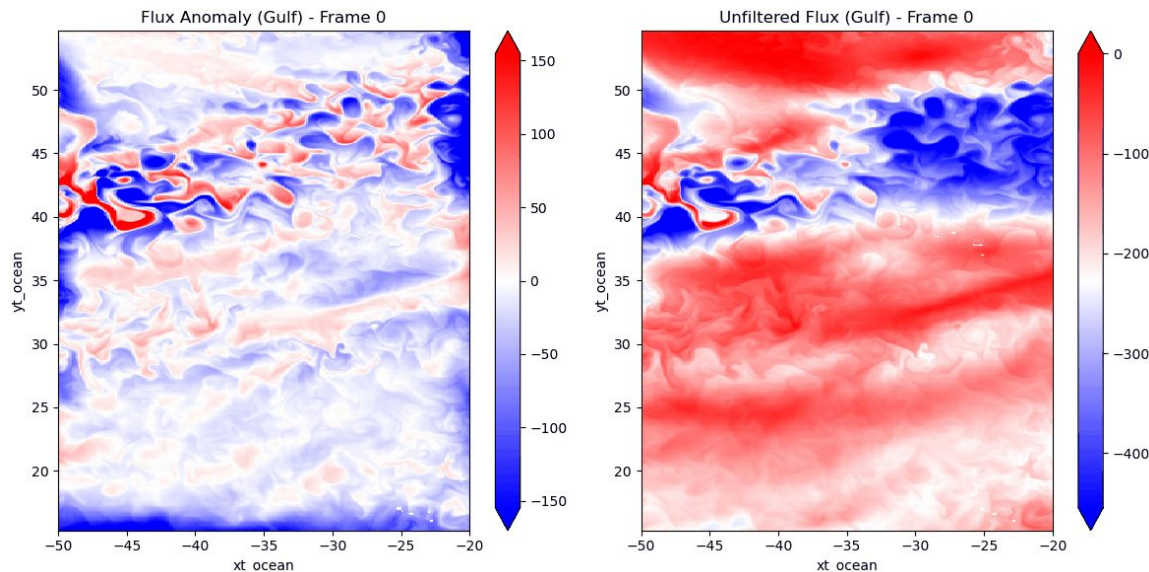


- Background large-scale freshwater loss shows up for all the anomaly maps, regardless of scale
- Eddies are seen in all anomaly maps
- On small scales, freshwater loss from the ocean seems to be larger within eddy structures



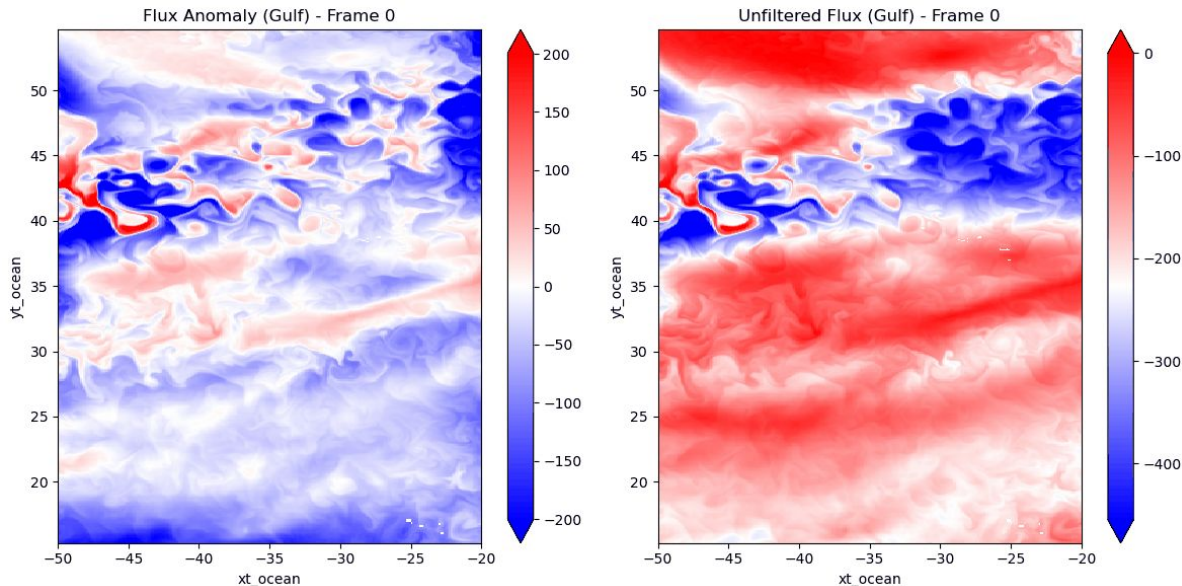
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Gulf Stream – Heat Flux Anomaly (unfiltered - filter scale 50)



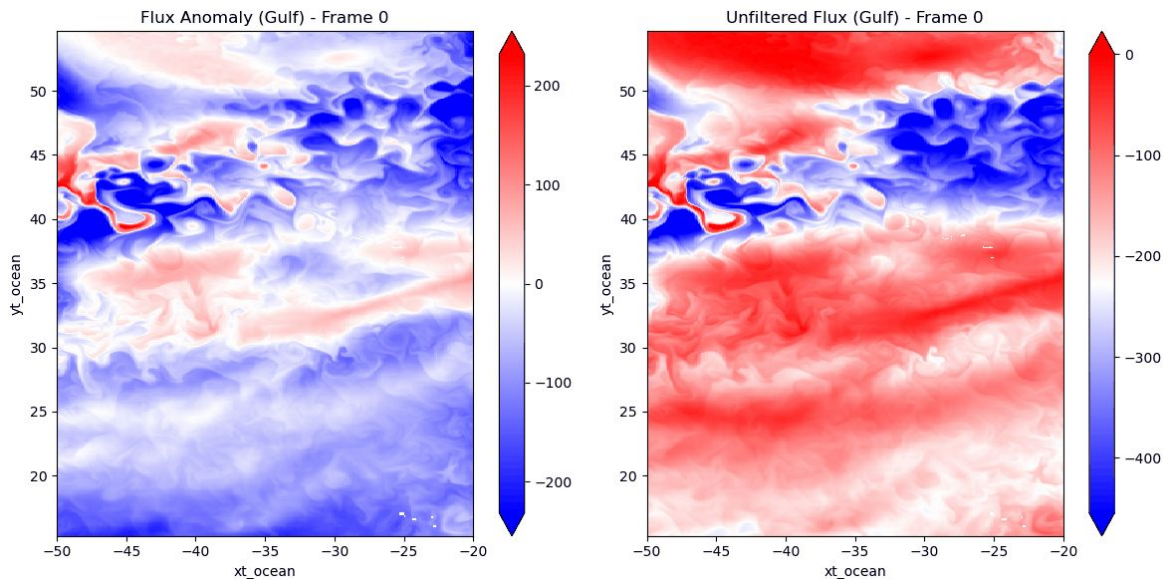
- The small-scale eddies show up very well in the all-scale and anomaly maps
- There is a net eastward movement of the heat flux patterns
 - It shows up as a background flux in the anomaly map, but is clearer on the all-scale map

Gulf Stream – Heat Flux Anomaly (unfiltered - filter scale 100)



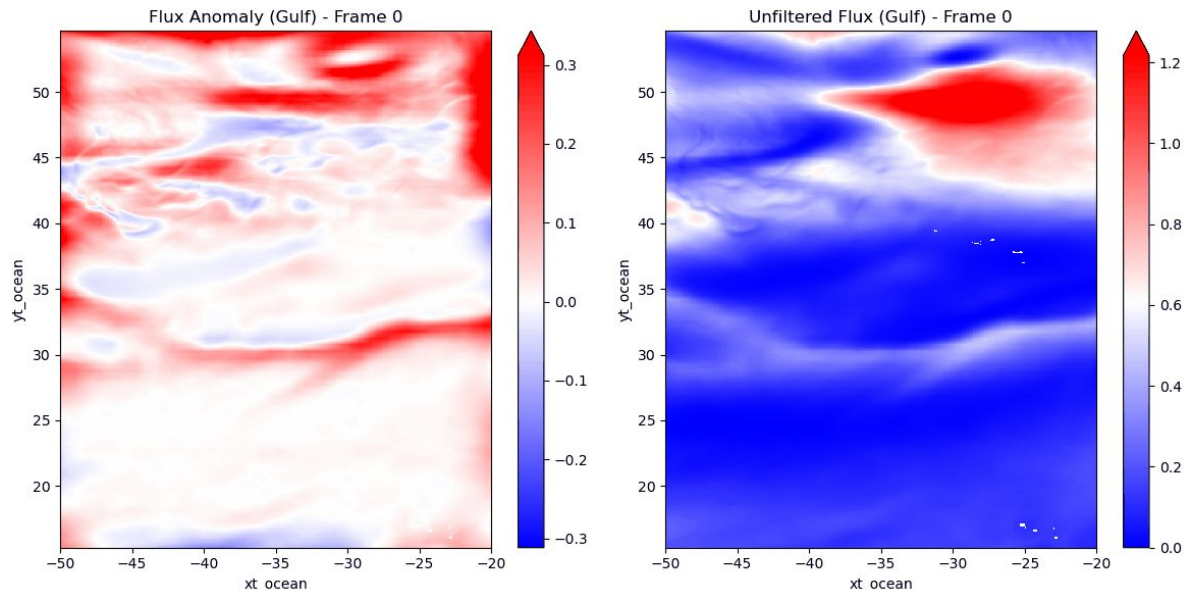
- As filter scale increases, the positive heat flux that shows up in the eddies is less prominent
- The heat flux is negative for the all-scale map, indicating that heat is almost always lost from the ocean to the atmosphere in this region

Gulf Stream – Heat Flux Anomaly (unfiltered - filter scale 150)



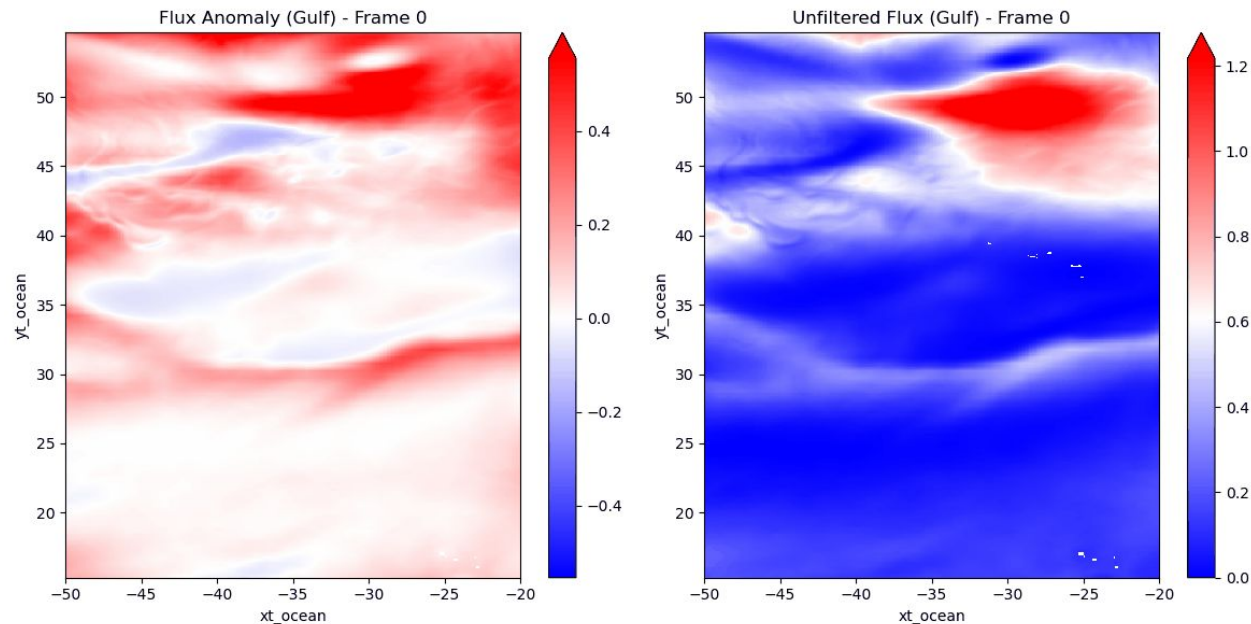
- Eddies seem to play an important role in holding onto positive or negative heat fluxes for the anomaly maps
 - After the larger-scale background patterns pass, the eddies still hold onto their sign for heat flux for a while

Gulf Stream – Momentum Flux Anomaly (unfiltered - filter scale 50)



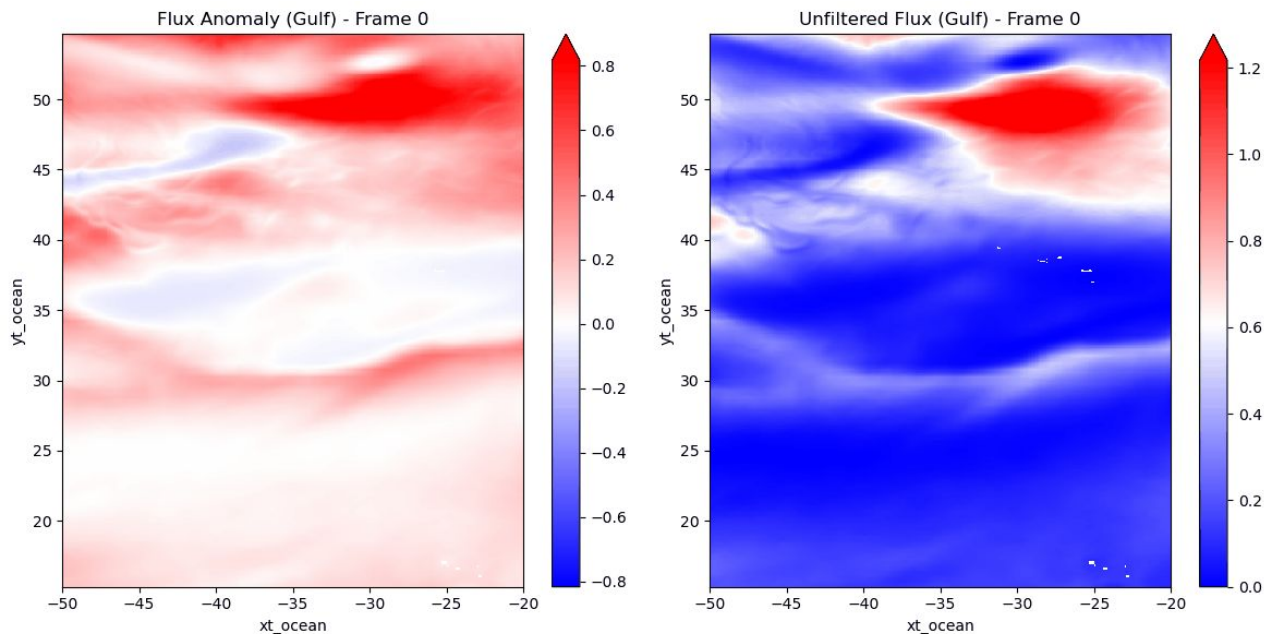
- Dynamical patterns are similar between the all-scale and anomaly images
- On all-scale image, fluxes are all positive, meaning the atmosphere is forcing the ocean for the most part
- The anomaly map has very small spatial gradients

Gulf Stream – Momentum Flux Anomaly (unfiltered - filter scale 100)



- Flux anomaly maps look positive for the vast majority of timesteps and locations
 - Even for the anomalies, the atmosphere is mostly forcing the ocean

Gulf Stream – Momentum Flux Anomaly (unfiltered - filter scale 150)



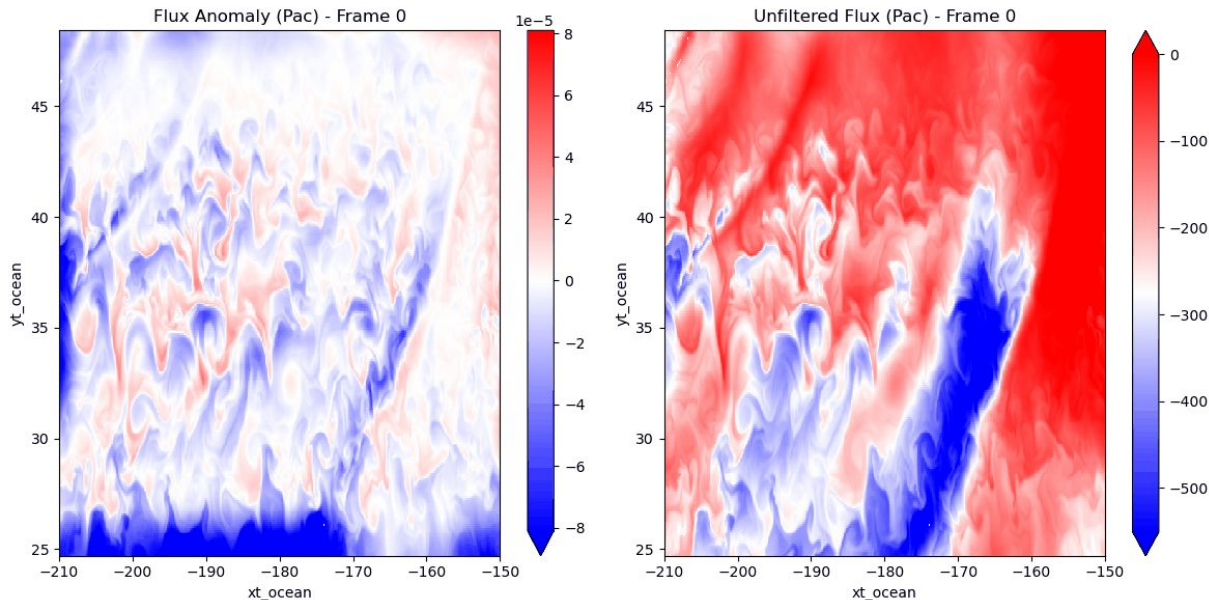
- There seem to be very little evidence of eddy behavior, which is interesting because we saw eddies for the heat and freshwater fluxes and their anomalies in this region
- There seems to be a large eddy at the top that has mixed +ve and -ve fluxes at large-scales (see all-scale map)

NORTH PACIFIC REGION



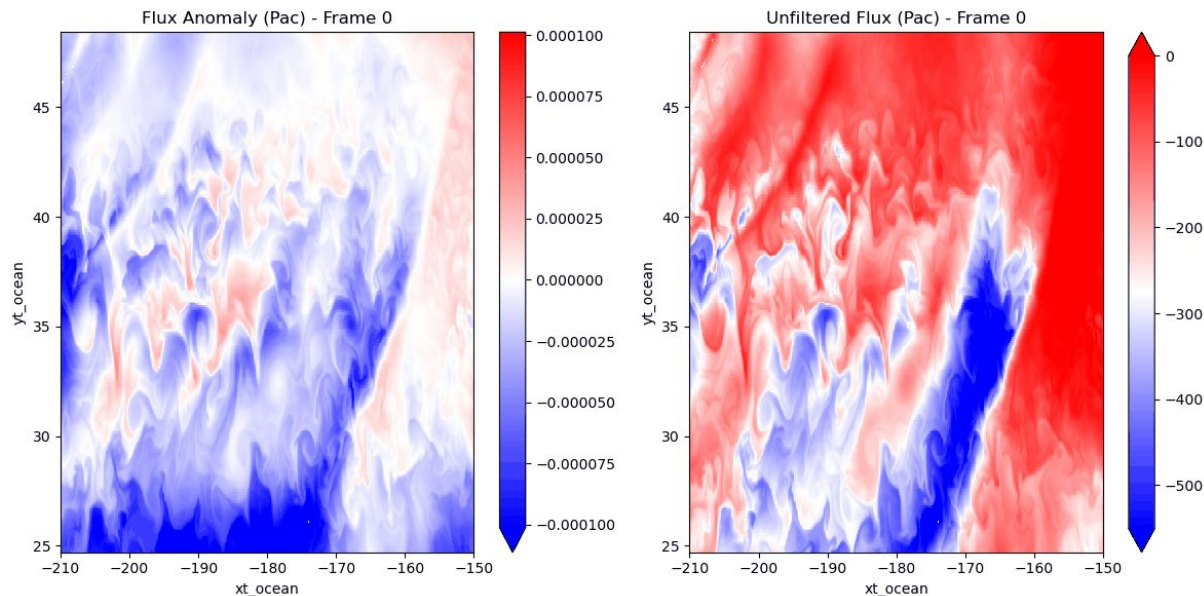
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North Pacific – Freshwater Flux Anomaly (unfiltered - filter scale 50)



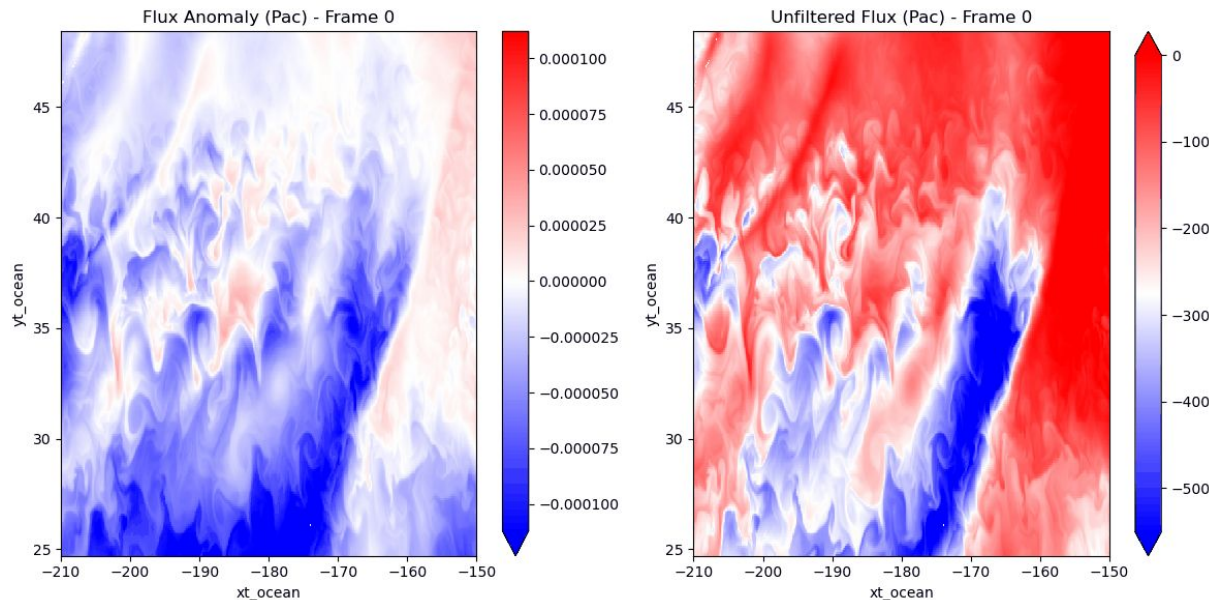
- +ve freshwater flux indicates freshwater is added to the ocean
- -ve freshwater flux indicates freshwater is removed from the ocean
- More freshwater leaves the ocean than is added

North Pacific – Freshwater Flux Anomaly (unfiltered - filter scale 100)



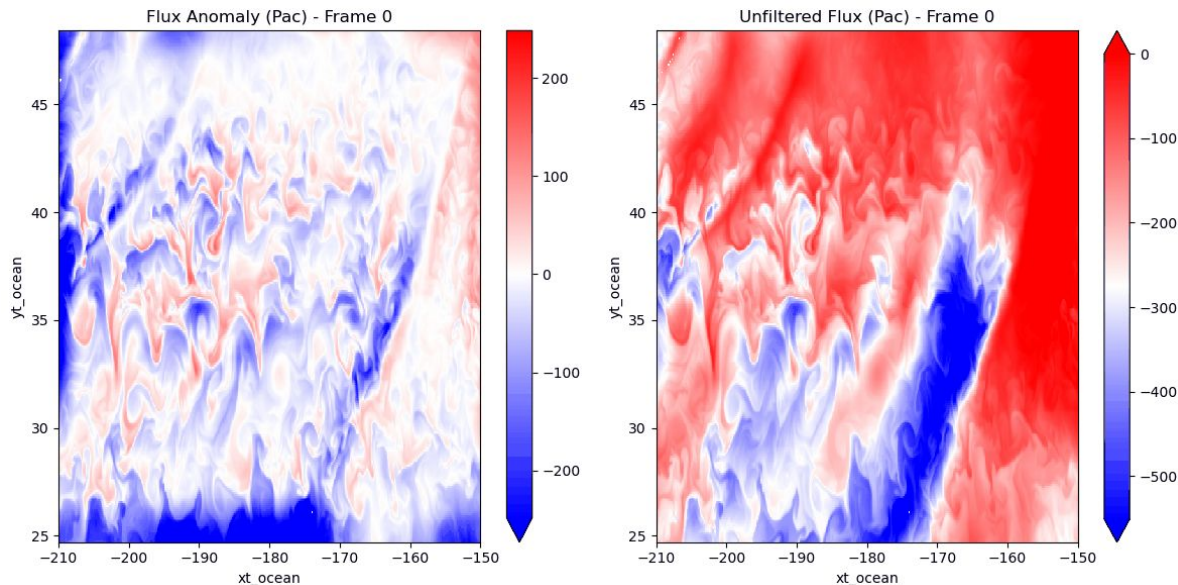
- Net eastward movement of large-scale freshwater loss from ocean
- On small scales, there are small patches of freshwater loss from ocean in eddies, but mostly freshwater is added to the ocean

North Pacific – Freshwater Flux Anomaly (unfiltered - filter scale 150)



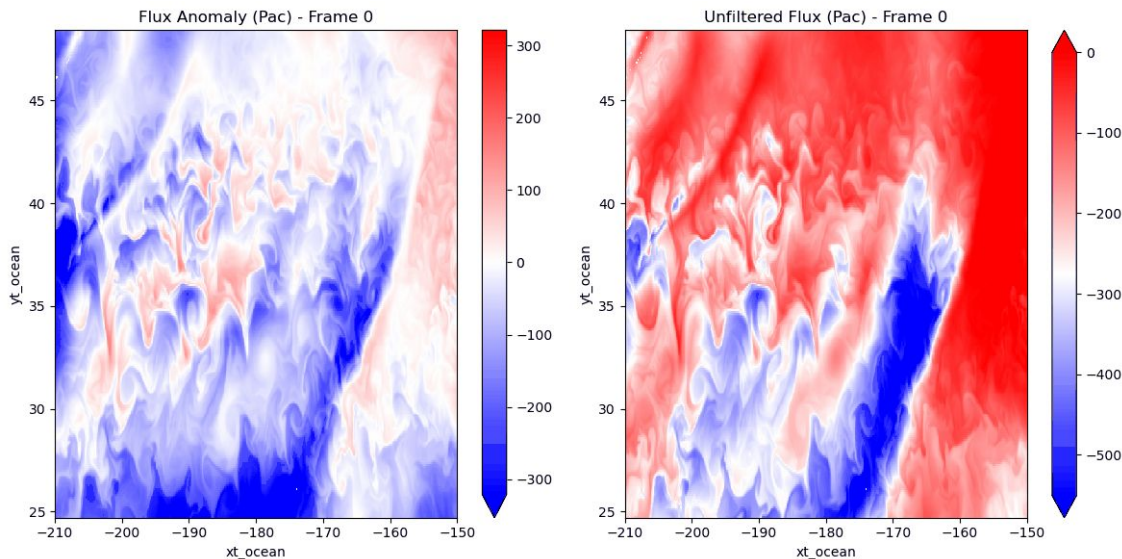
- As filter size increases, the small-scale features seem to have more variability in freshwater flux
 - For smaller filter scales, there seems to be more of a steady state spatial small scale freshwater flux distribution

North Pacific – Heat Flux Anomaly (unfiltered - filter scale 50)



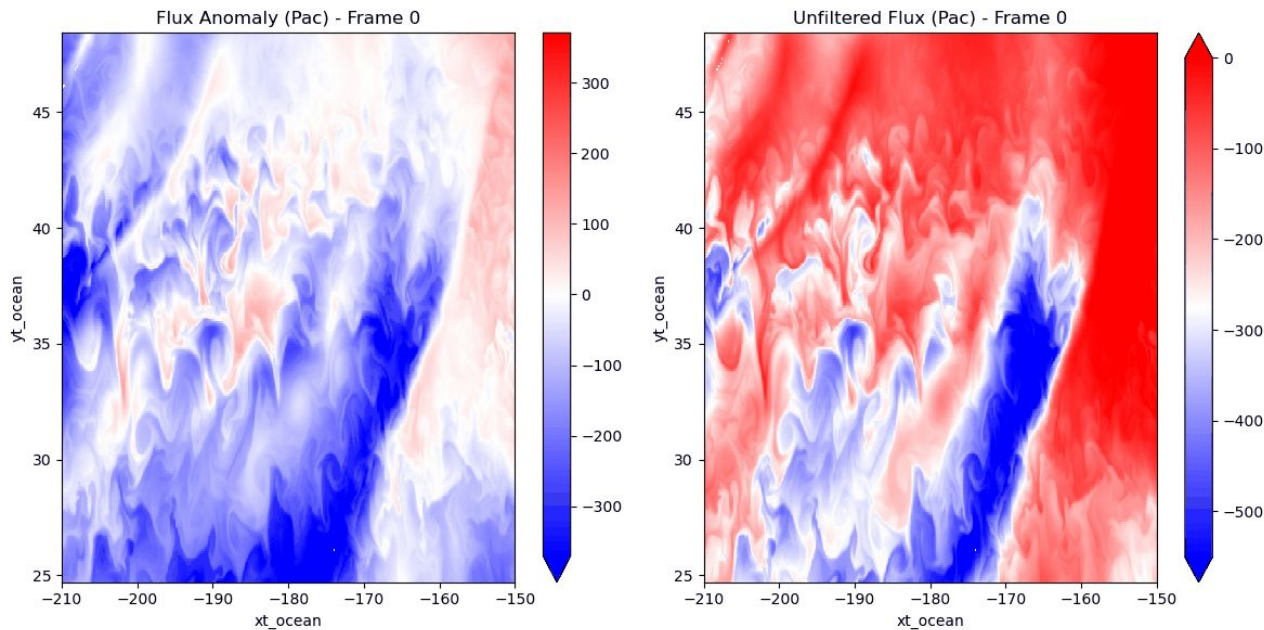
- Net zonal flow of heat flux patterns in the all-scale and the anomaly maps
- Heat flux is negative for the all-scale map at most locations, so heat is mostly lost from the ocean to the atmosphere

North Pacific – Heat Flux Anomaly (unfiltered - filter scale 100)



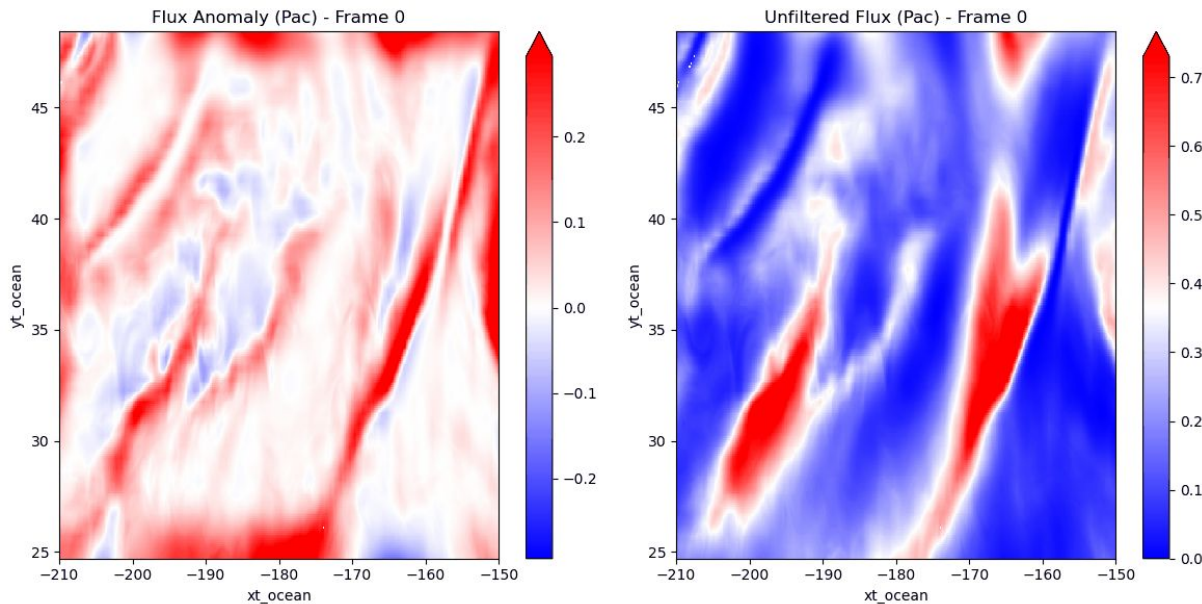
- As filter scale goes up, the anomaly magnitude seems to go up
- As filter scale increases, there is less of a steady state with the small-scale features we see

North Pacific – Heat Flux Anomaly (unfiltered - filter scale 150)



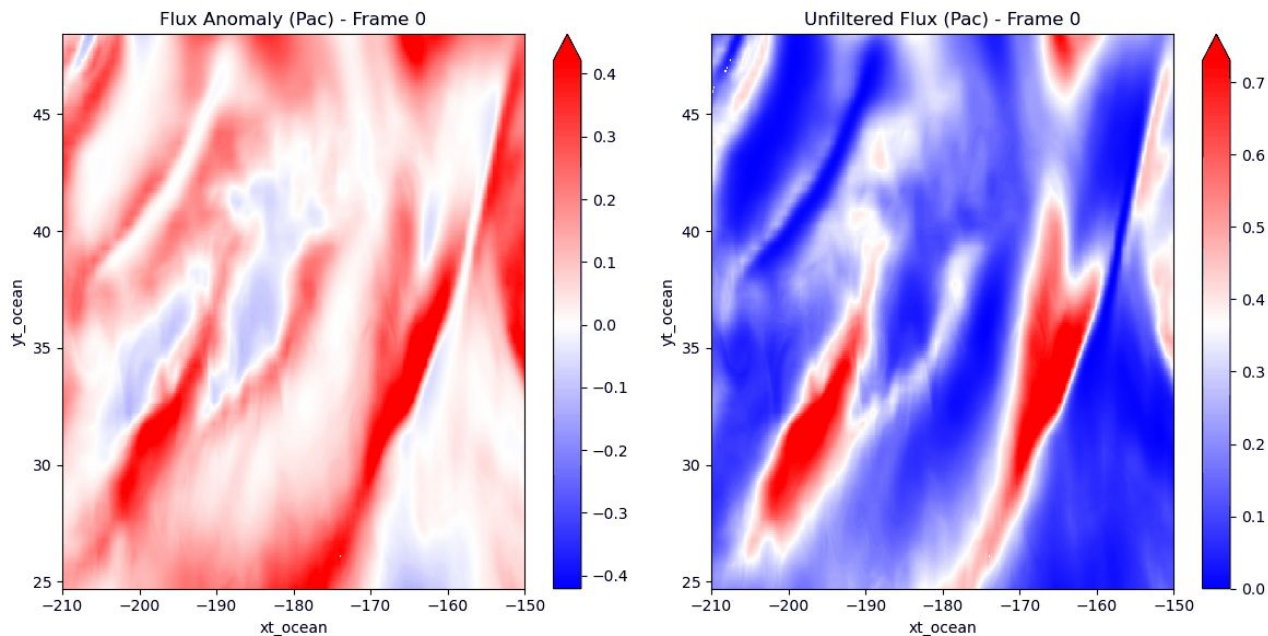
- Strong similarities in the dynamics of both maps are clear
- Eddies in the north seem to hold onto background heat flux patterns after they've passed better than eddies in the south

North Pacific – Momentum Flux Anomaly (unfiltered - filter scale 50)



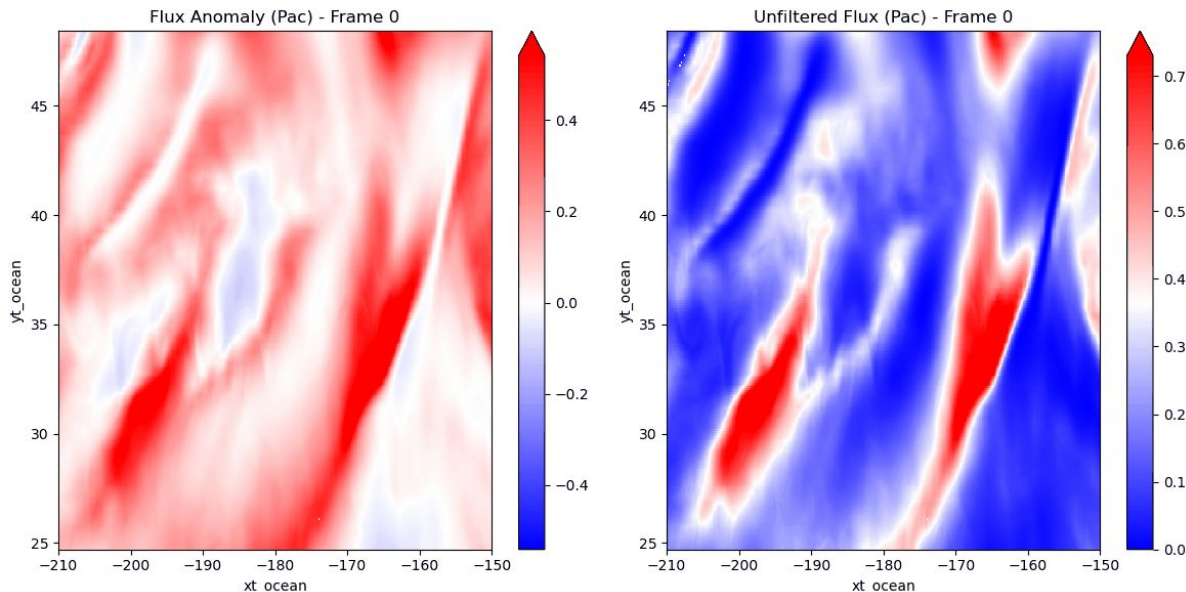
- We see thin positive tendrils in the anomaly graph, mixed with some negative regions
 - This indicates that on small scales, the atmosphere and ocean are transferring momentum back and forth
 - On large scales, it seems more unidirectional

North Pacific – Momentum Flux Anomaly (unfiltered - filter scale 100)



- We see small eddies for the freshwater and heat fluxes and their anomalies in this region, but only see larger-scale dynamical behavior for the momentum anomaly
- The all-scales image has all positive anomalies, indicating that the atmosphere is forcing the ocean across the whole region

North Pacific – Momentum Flux Anomaly (unfiltered - filter scale 150)



- There are much sharper gradients for the anomaly case than for the all-scales case
- The anomaly maps are also mostly positive, indicating the atmosphere is forcing the ocean