

## Sub-Seasonal Prediction skill of GEFSv12 for Atmospheric Rivers and Associated Precipitation Forecasts over the U.S. West Coast

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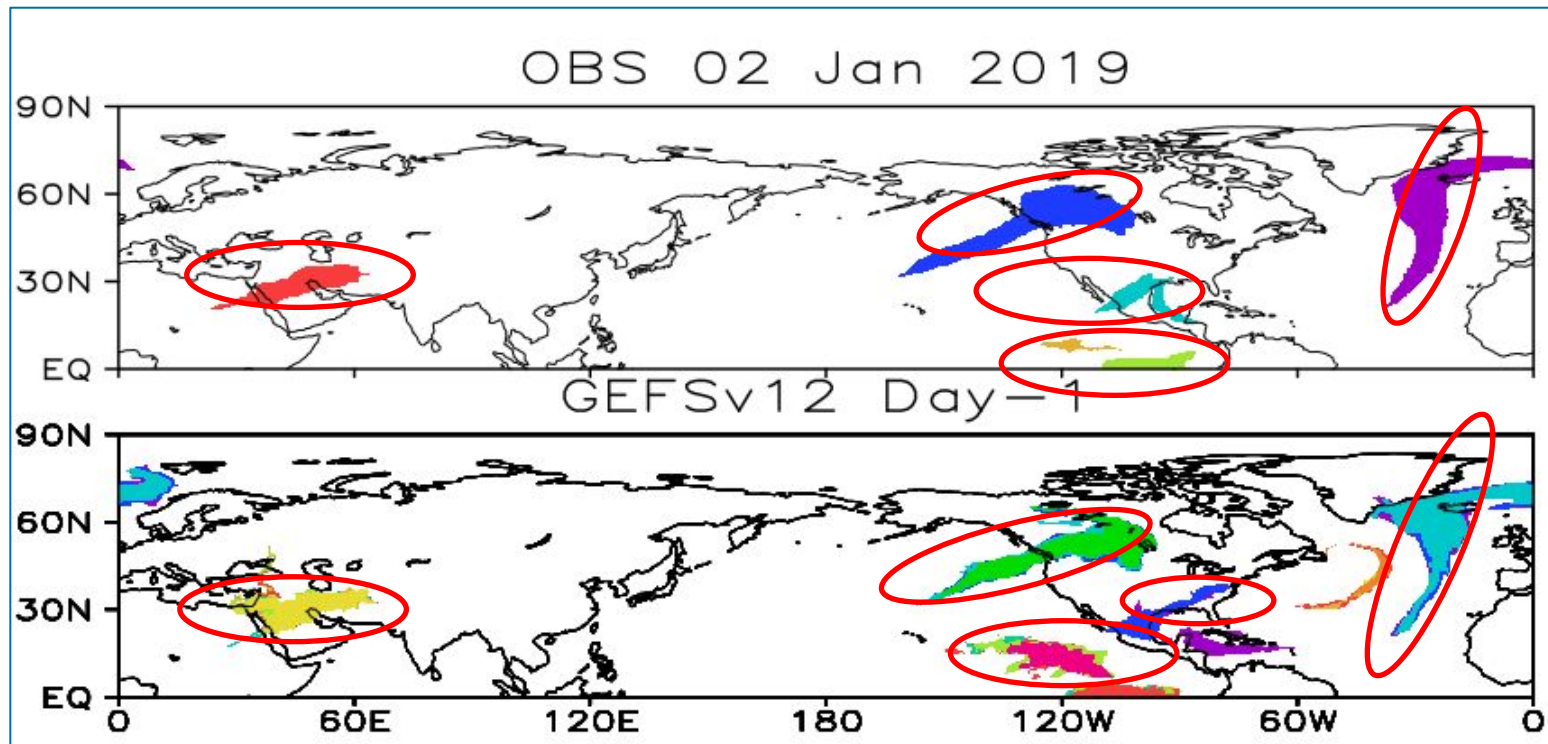
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### Background:

- Accurate predictions of AR on sub-seasonal time scale can be beneficial for various risk management sectors and for planning hydrometeorological applications.
- GEFSv12 was made operational at NCEP in September 2020 to provide stakeholders with sub-seasonal forecasts for hydrological applications. The consistent reforecast data of this is available for 2000-2019.
- AR Prediction Skill of GEFSv12 Reforecasts is examined for Weeks 1, 2, 3 to 4, and Monthly scale along with inter-annual variability. ARs detected by using Guan & Waliser (2019) criteria.

## Case Study

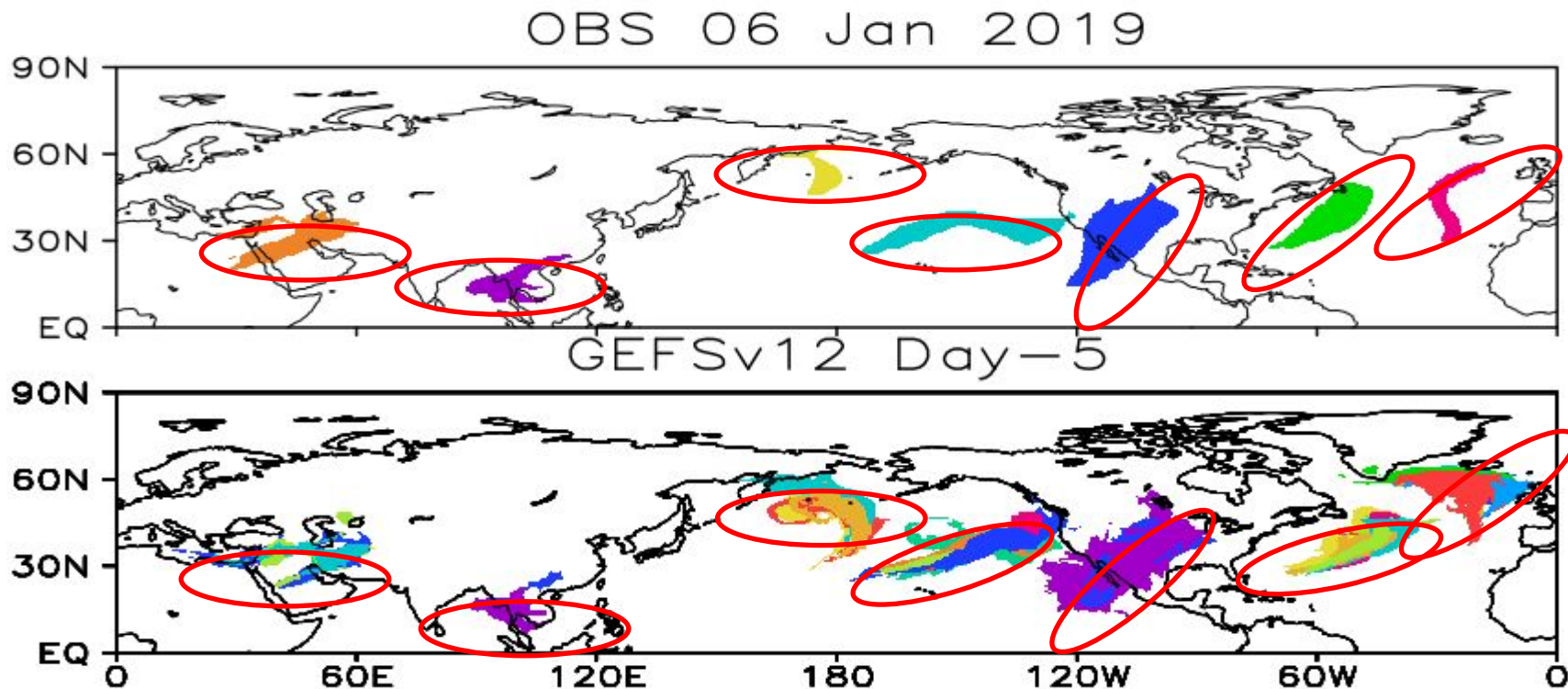
Performance of GEFsv12 in depicting AR over Northern Hemisphere 11 members based on 02 Jan 2019 00UTC initial conditions



- All members of GEFsv12 are good in detecting AR with Day-1 forecast lead time. The AR from all the members coincide.

## Case Study

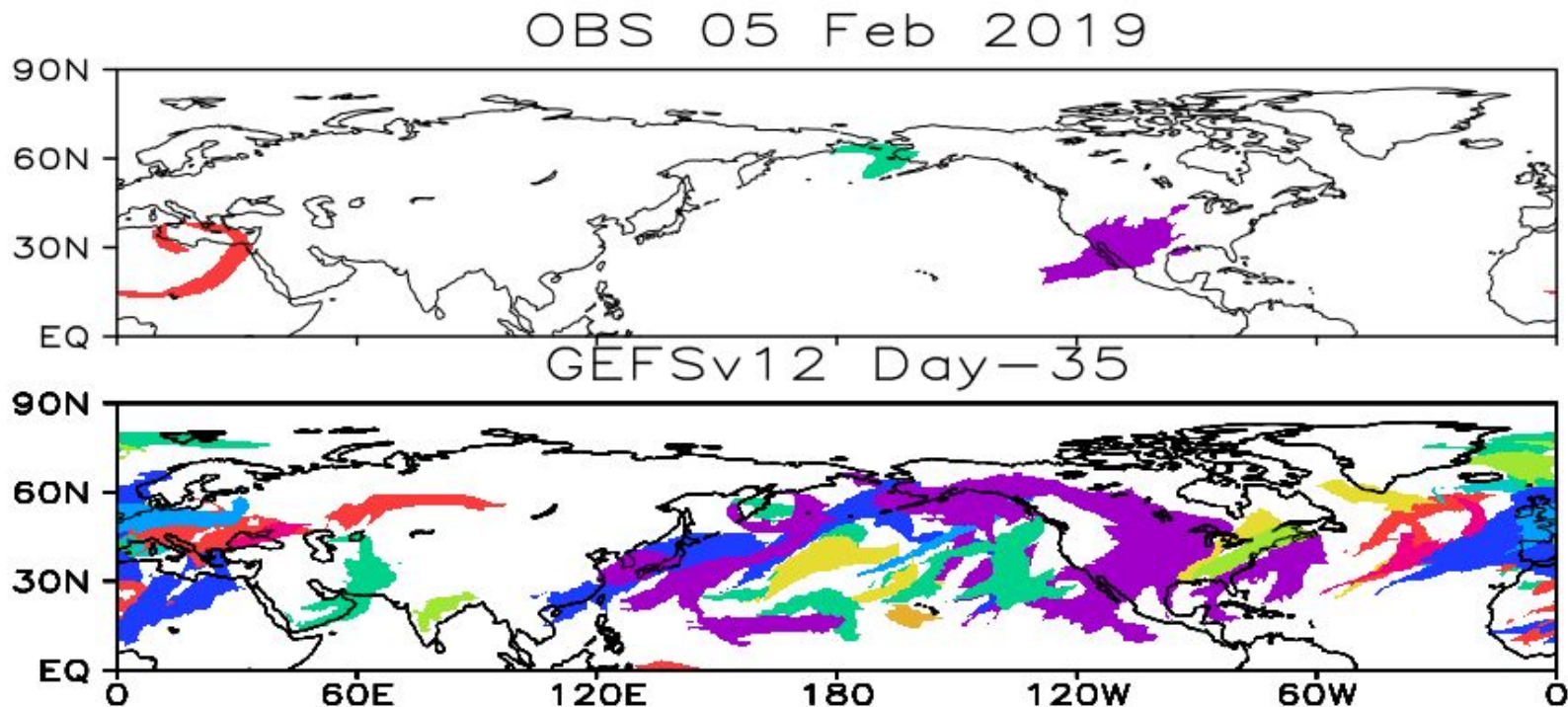
Performance of GEFSv12 in depicting AR over Northern Hemisphere for Day-1 to 35 lead time forecast with 11 members based on 02 Jan 2019 00UTC initial conditions



- All members of GEFSv12 are good in detecting AR with Day-5 forecast lead time. The AR from all the members are coincide.

## Case Study

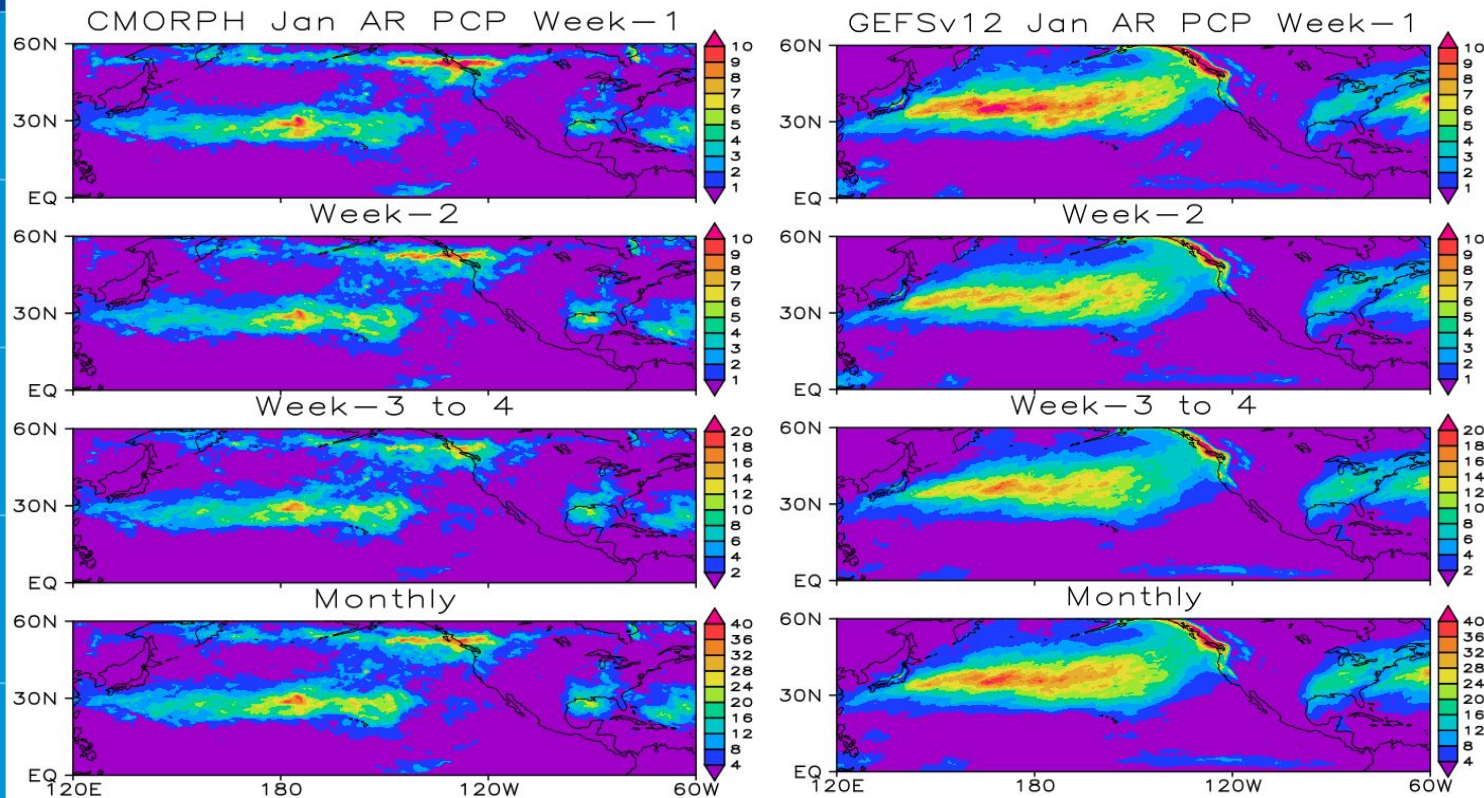
Performance of GEFSv12 in depicting AR over Northern Hemisphere for Day-1 to 35 lead time forecast with 11 members based on 02 Jan 2019 00UTC initial conditions



- AR spread region from all members of GEFSv12 is increased with forecast lead time and it leads to low probability AR in large area and causes to overestimation of AR.

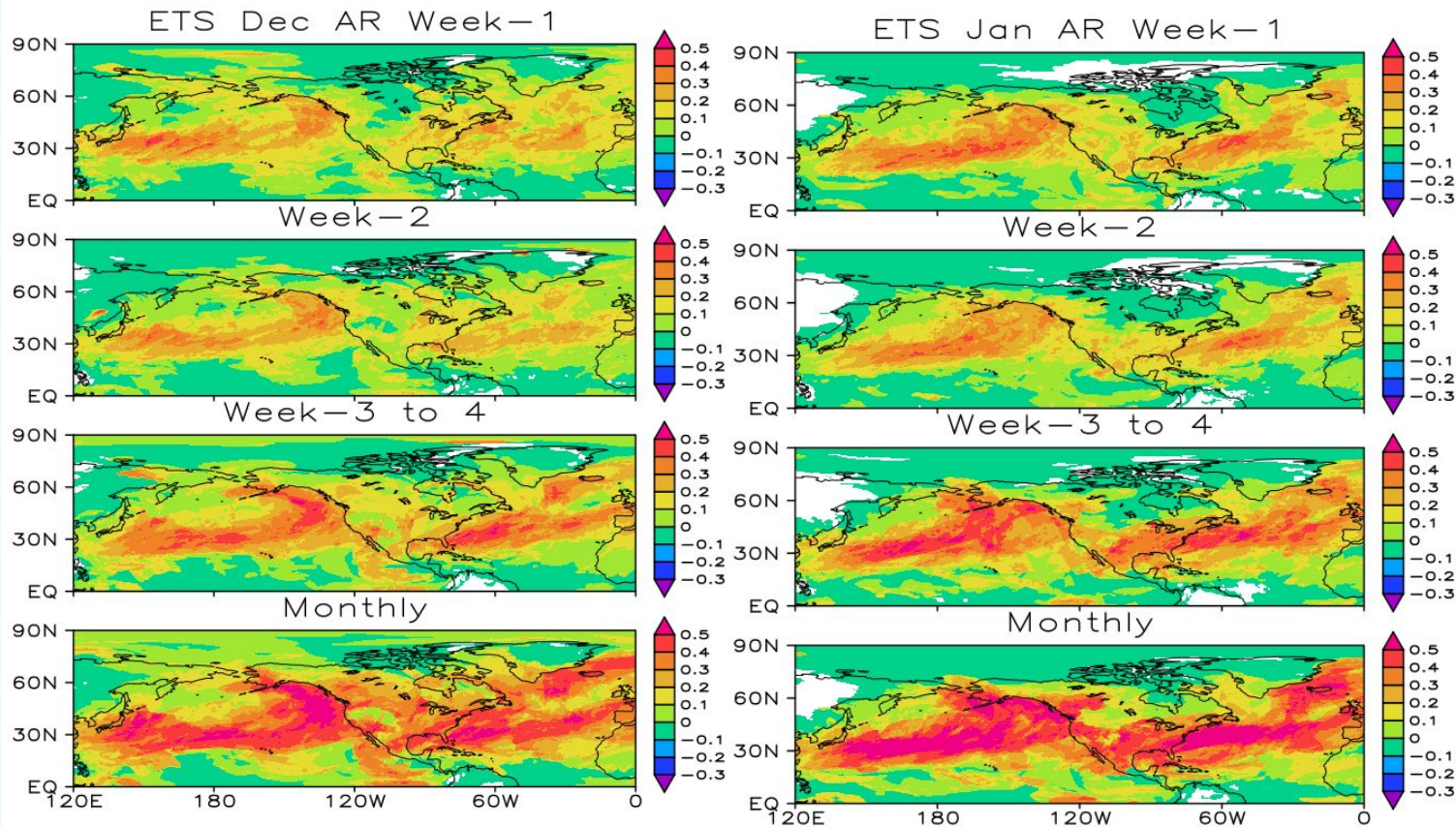


# Composite AR precipitation mean (mm) for Week-1, 2, 3 to 4 and Monthly scale from CMORPH and GFSv12 in with January conditions based on ERA5 AR.



- The composite AR precipitation patterns is similar to CMORPH.
- Overestimation of precipitation and larger area of AR precipitation occurrence.

# ETS of GEFSv12 in depicting AR with December and January initial conditions

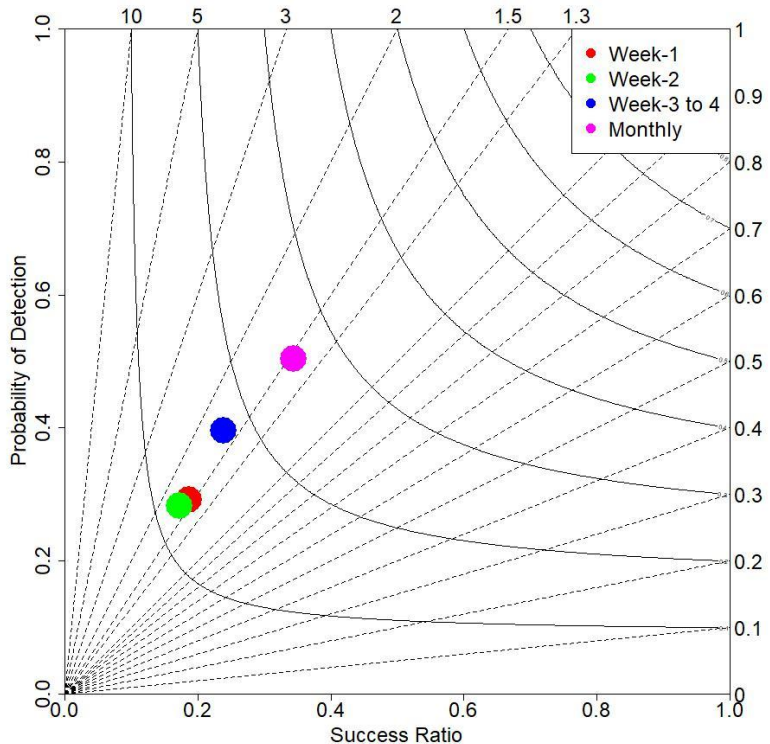


- ETS is higher over prominent AR regions for all forecast lead times. The ETS of AR increases with length of forecast scale.

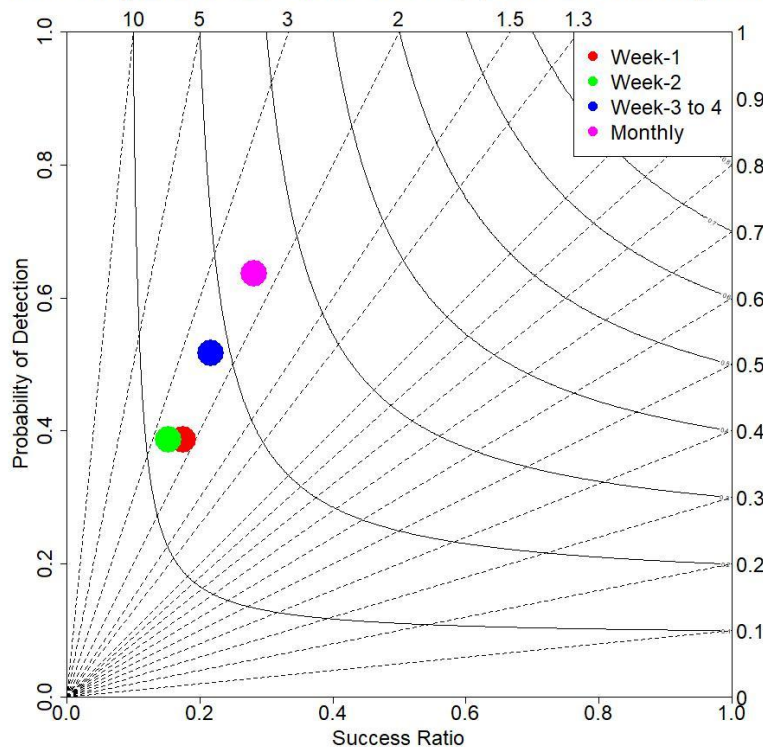


# Categorical skill Scores of GFSv12 in depicting AR with December and January initial conditions

Perf. Diagram for Dec AR on Week-1,2,3 to 4 and Monthly scale



Perf. Diagram for Jan AR on Week-1,2,3 to 4 and Monthly scale



- Most of Categorical skill Scores are relatively higher over prominent AR regions for all forecast lead times. These skill score are increases with length of forecast scale.

# Summary & Conclusions

- GEFSv12 was able to capture the spatial patterns of ARs over the North Pacific for Week-1, 2, 3 to 4, and Monthly time scales. Interannual Variability (IAV) is overestimated for longer lead times and Coefficient of Variation decreased with lead time.
- GEFSv12 has good prediction skills (CC and IOA) for Weekly ARs, particularly in regions where ARs are prominent.
- Hit rate/ POD ( $>0.8$ ), ETS, SR, FAR, and TS are all higher over prominent AR regions with low false alarm rate and a high success rate (SR  $> 0.6$ ) in prominent AR regions.
- The accuracy of weekly/monthly ARs can be improved by implementing an appropriate calibration technique.

## Thank You