**This study, *Forecasting with Fishers,* deployed the Weather Research and Forecasting (WRF) model to dynamically downscale global model data to represent the mesoscale flow at a regional resolution. The simulations were continued to provide forecasts at 1–3 days leads for each day of the 2020-2022 monsoon seasons. These forecasts are verified against corresponding ERA5 observations.**

**WRF model**

The Advanced Research WRF (ARW) incorporates additional components to produce simulations. Thus, it is a subset of the WRF system that encompasses physics schemes, numeric/dynamics options, initialisation routines, and a data assimilation package (WRFDA). It is based on a Eulerian solver. The model version used for this study is ARW version 4.0 (Skamarock et al. 2019). The mesoscale, non-hydrostatic WRF model version 4.0 (Skamarock et al., 2019) was used to produce dynamically downscaled forecasts. A three-day forecast was initialised at 0000 UTC every day during the monsoon season of 2020 producing 122 simulations. Forcing of initial and lateral boundary conditions was achieved by the National Centers for Environmental Prediction (NCEP) GFS historical archive analysis data, at 0.25◦ spatial and 6 hr temporal resolution. The spatial setup involves two domains between which two-way nesting was used at a 3:1 parent-to-child domain spatial ratio. This allows the parent domain (lower resolution – 15km) to communicate with the child domain (higher resolution – 5km) and vice versa. Table 1 denotes the model configurations.

**The ERA5 Global Reanalysis data**

ERA5 is the fifth generation European Centre for Medium-Range Weather Forecast (ECMWF) reanalysis for the global climate and weather. It provides hourly estimates of multiple atmospheric, land and oceanic climate variables, covering a 30km grid and resolves the atmosphere using 137 levels up to a height of 80km.

Atmospheric data are interpolated to 37 pressure, 16 potential temperature and 1 potential vorticity level(s) by a powerful postprocessing package (Hersbach et al., 2020). "Surface or single level" data are also available, containing parameters such as precipitation, top of atmosphere radiation and vertical integrals over the entire depth of the atmosphere. The data is available with a spatial resolution of 0.25° and temporal resolution of one hour. It includes information about uncertainties for all variables at reduced spatial and temporal resolutions. ERA5 combines archival observations into global estimates using advanced modelling and data assimilation systems and it is open source.

REFERENCES: i) Hersbach, H et al. (2020). The ERA5 Global Reanalysis. *Quarterly Journal of the Royal Meteorological Society* 146: 1999-2049. https://doi.org/10.1002/qj.3803;

ii) Skamarock, WC et al. (2021). A Description of the Advanced Research WRF Model Version 4.3 (No. NCAR/TN- 556+STR). <http://dx.doi.org/10.5065/1dfh-6p97>

**SOFTWARE: The files can be downloaded by right clicking the file and using the download option. For plotting**

**the data, it is in NetCDF format. Grads, NCL, Python, MATLAB, etc., can be used. We have used Python for our analysis. The Python code used is shown below.**

#!/usr/bin/env python3 # -\*- coding: utf-8 -\*- """

Created on 23-03-2022 12:14:45

@author: i-rok """

import time start=time.time() import numpy as np import xarray as xr

import matplotlib.pyplot as plt import cartopy.crs as ccrs

from cartopy.io.shapereader import Reader from cartopy.feature import ShapelyFeature from cartopy import feature

from scipy.interpolate import RegularGridInterpolator import matplotlib.dates as mdates

import datetime as dt import shapefile import regionmask

from shapely.geometry import shape import sklearn.metrics

import metpy import glob

plt.rcParams['legend.fontsize'] =14

fnames=glob.glob('/media/i-rok/disk1/sarang\_data/wrfout\_jjas\_wind\_\*.nc') latmin=7.5

latmax=9 lonmin=76 lonmax=78

start\_date='2020-06-01' end\_date='2022-09-30'

drop\_list=['ua\_1day','va\_1day', 'ua\_2day','va\_2day', 'ua\_3day','va\_3day']

da=xr.open\_mfdataset(fnames,drop\_variables=drop\_list) da=da.sel(latitude=slice(latmin,latmax),longitude=slice(lonmin,lonmax),time=slice(s tart\_date,end\_date)) data=data.resample(time='1D').mean(dim=['time','latitude','longitude'])

era\_data= xr.open\_mfdataset(['/media/i-rok/disk1/ERA-5/u10\_v10\_jjas\_2020- 21.nc','/media/i-rok/disk1/ERA-5/u10\_v10\_jjas\_2022.nc']) era\_data=era\_data.sel(latitude=slice(latmin,latmax),longitude=slice(lonmin,lonmax), time=slice(start\_date,end\_date)) era\_data=era\_data.resample(time='1D').mean(dim=['time','latitude','longitude'])

uwnd=[data.U10\_1day,data.U10\_2day,data.U10\_3day,era\_data.u10] vwnd=[data.V10\_1day,data.V10\_2day,data.V10\_3day,era\_data.v10] titles=['1day','2day','3day','Obs']

colors=['red','green','orange','black'] end = time.time()

print ("Time taken: ", (end-start), "s")