Hybrid Statistical Downscaling in Reducing Bias in drivers of Compound wet-warm event during the West African Summer Monsoon

Ebiendele Precious , Koji Dairaku and Adigun Paul

Department of Engineering Mechanics and Energy, University of Tsukuba[1]

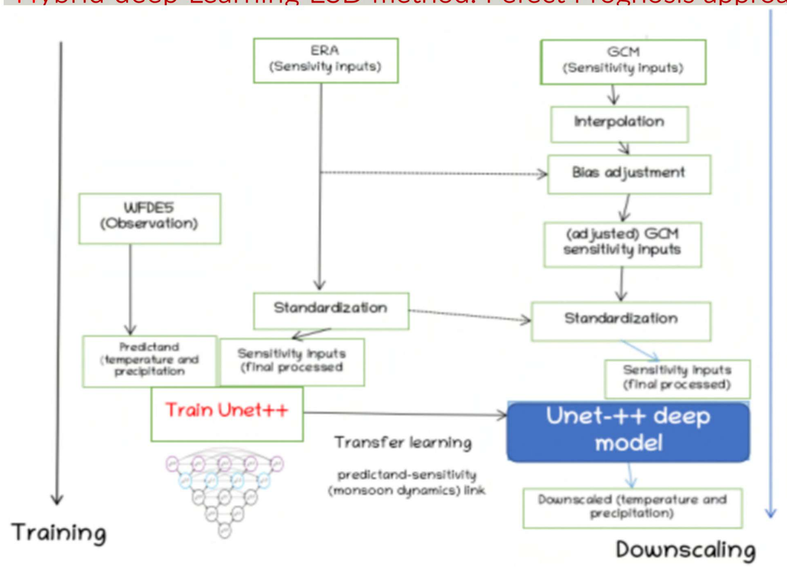
Introduction

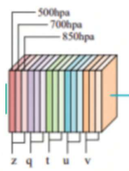
Climate adaptation and mitigation policies to compound heat extremes need accurate climate change projections. Despite decades of improvements, most climate models still have significant biases across highly populated regions.

The study present a prelimary baseline on the added value of adopting a physics mechanism driven complex hybrid networks of neural layers in downscaling the drivers (temperature and precipiation) of compound warm-wet events during the west africa summer monsoon season.

Deep Emprical statistical downscaling method is trained to learn a predictand-sensitivity (monsoon dynamics) link in an historical period (1982-2005)

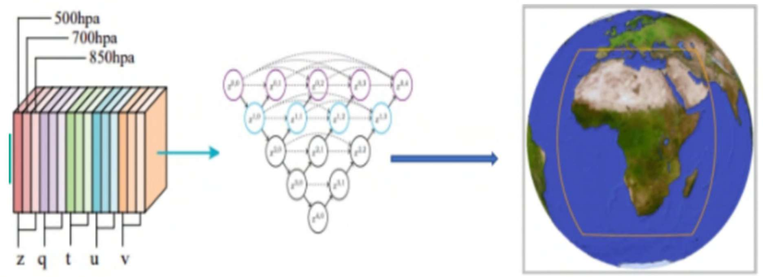
Hybrid deep Learning ESD method: Pefect Prognosis approach





Predictors	Pressure level
Temperature (t)	850, 700 and 500
Specific humidity (q)	850, 700 and 500
Zonal wind (u)	850, 700 and 500
meriodional wind (v)	850, 700 and 500
geopotential (z)	850,700 and 500

Deep Learning Framework (UNet ++)



Our study improved on the existing Convolutional neural network framework of Bano-Medina et al (2020), by adding new improved modifications to the training layers using a more complex nested UNet framework.

Downscaled drivers of compound event (Temperature): Deep Learning output

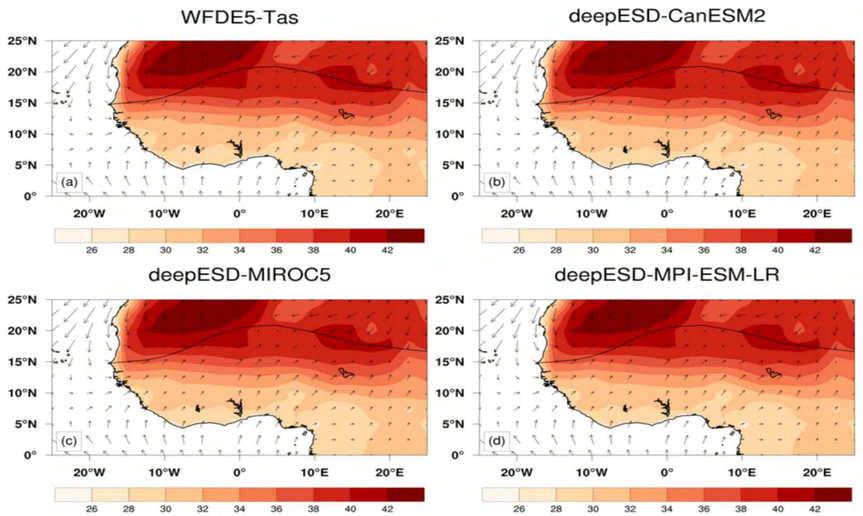


Fig 1: Downscaled temperature from (1982 to 2005) during the West Africa summer monsoon season

Downscaled drivers of compound event (Precipitation)

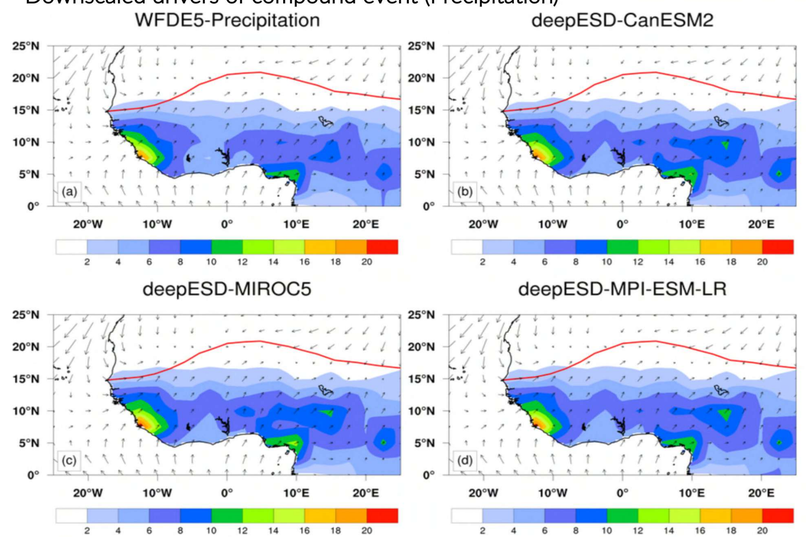


Fig 2: Downscaled Precipitation from (1982 to 2005) during the West Africa summer monsoon season

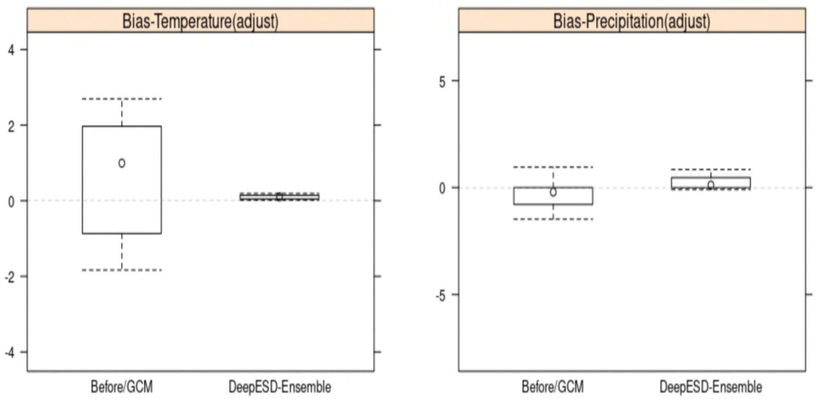


Fig 3:: Boxplot of bias before and after downscaling (Temperature and Precipitation)

Conclusions

- Our study indicated that the adopted deep learning downscaling approach could significantly reduce the large warm and dry bias present in GCM during the West Africa Monsoon season .

ebiendeleprecious95 @gmail.com