

Sensitivity of wind resource estimates to microphysics schemes in WRF

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Does rain slow down the wind?

- Rain event correlates with reduced wind speed
- Observed in both measurements and WRF
- Rain underestimation correlates with wind speed overestimation
- Microphysics scheme affects AEP estimate by few percent

Motivation

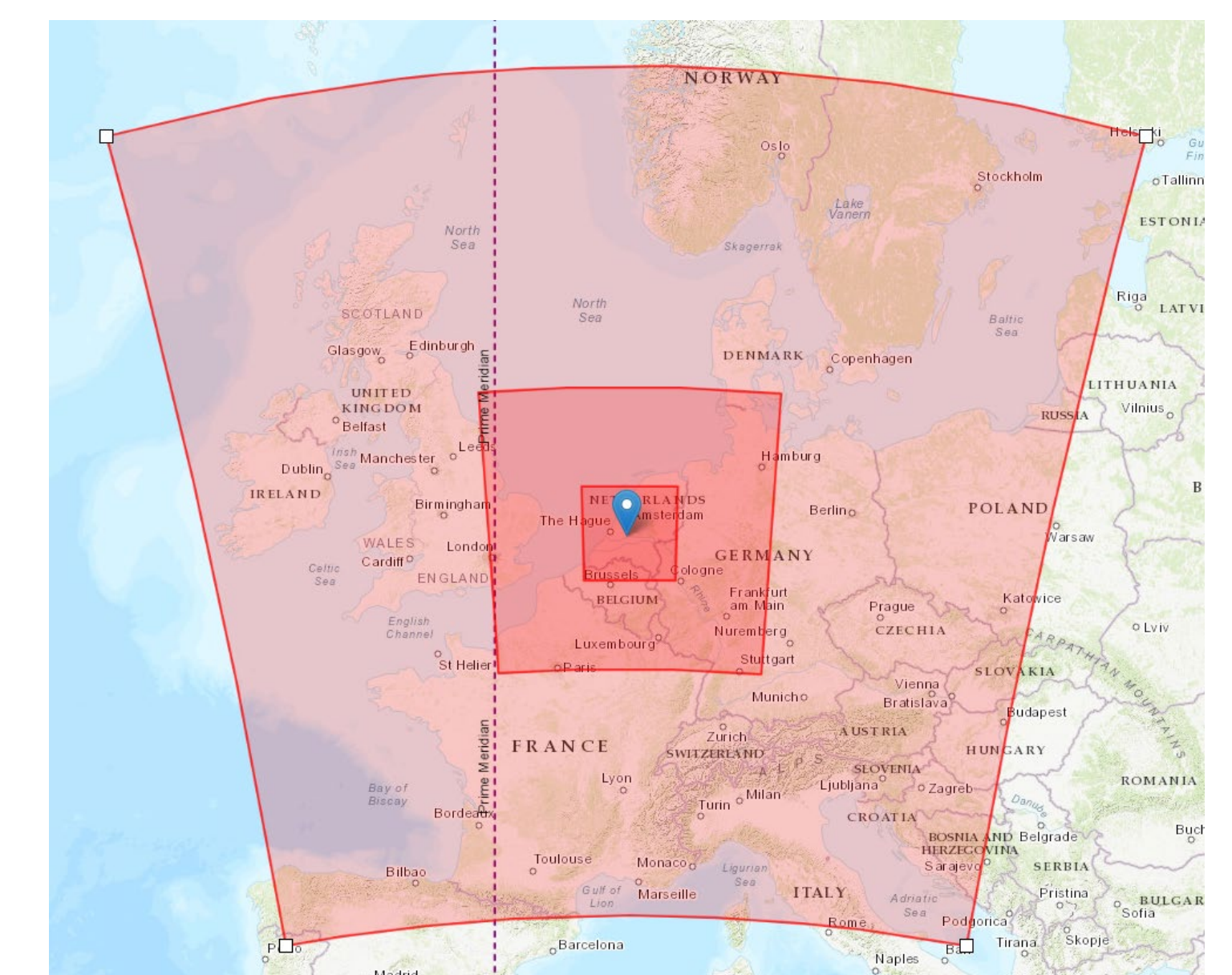
- Mesoscale models used for resource assessment
- Rain affects energy balance → affects wind resource: is this significant?
- Does a different microphysics scheme affect the wind resource?

WRF

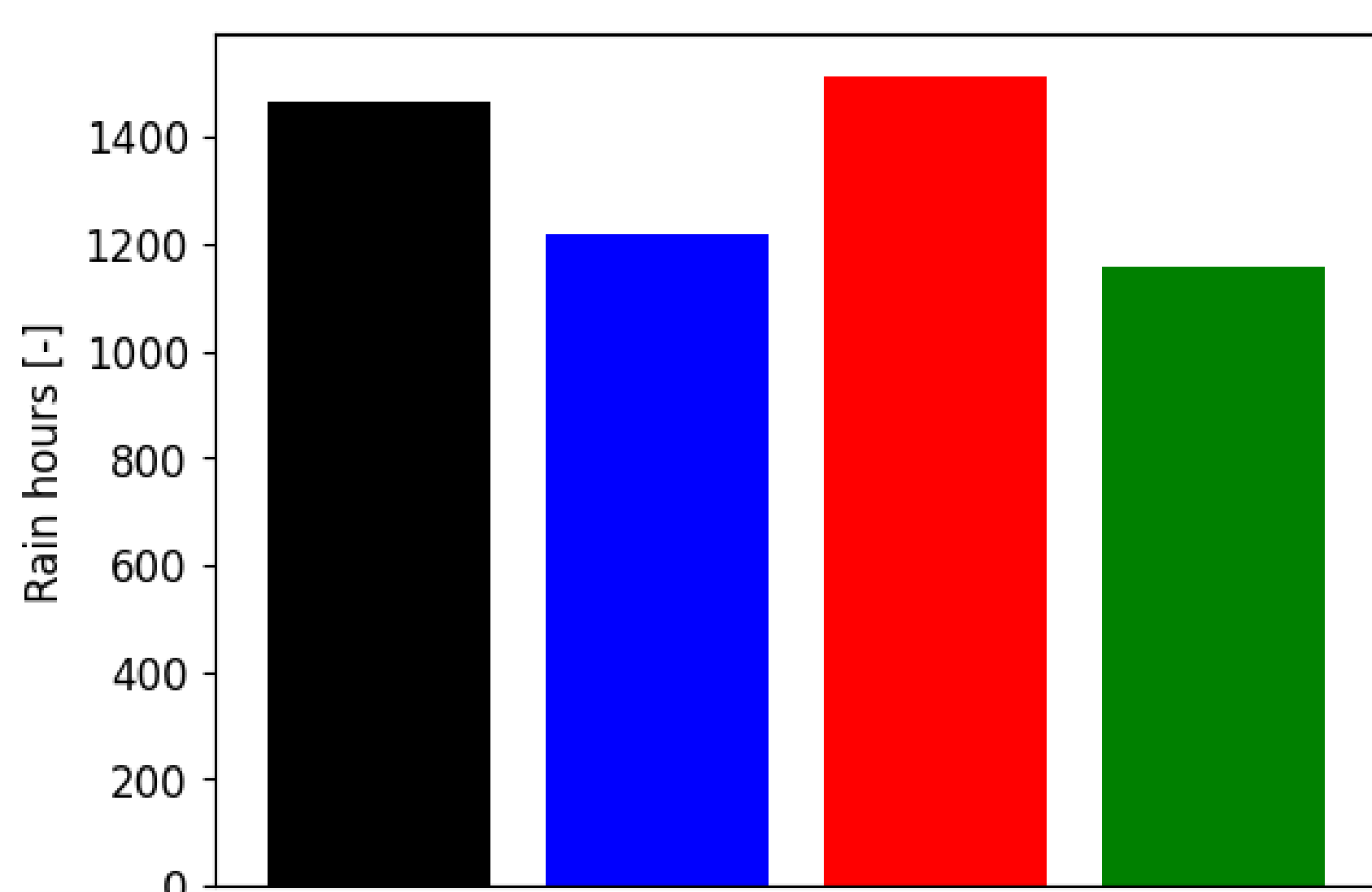
- WRF setup based on NEWA
- Microphysics schemes: droplet size distribution

Measurements

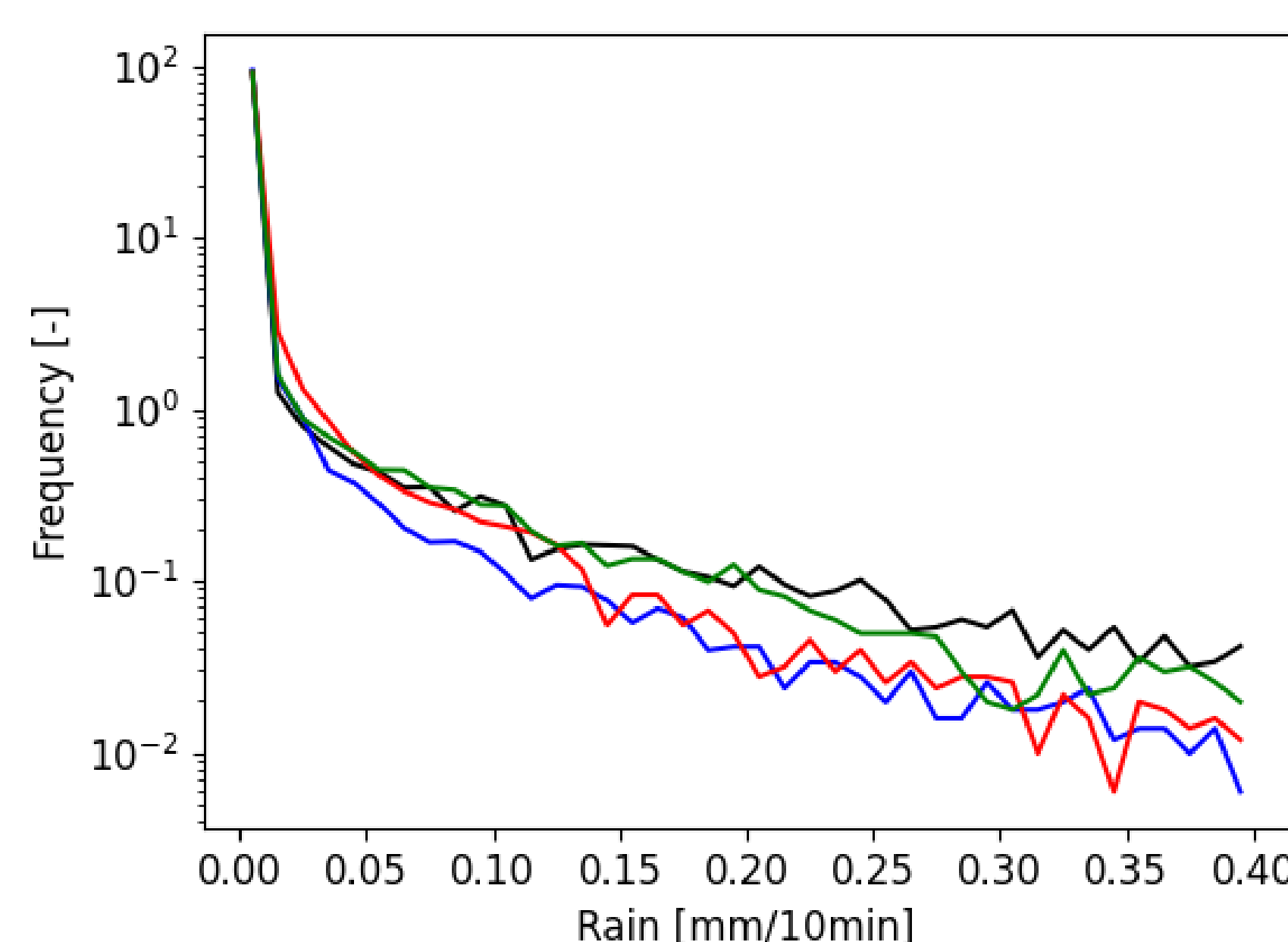
- KNMI-mast Cabauw
- 10 min wind speed & rain



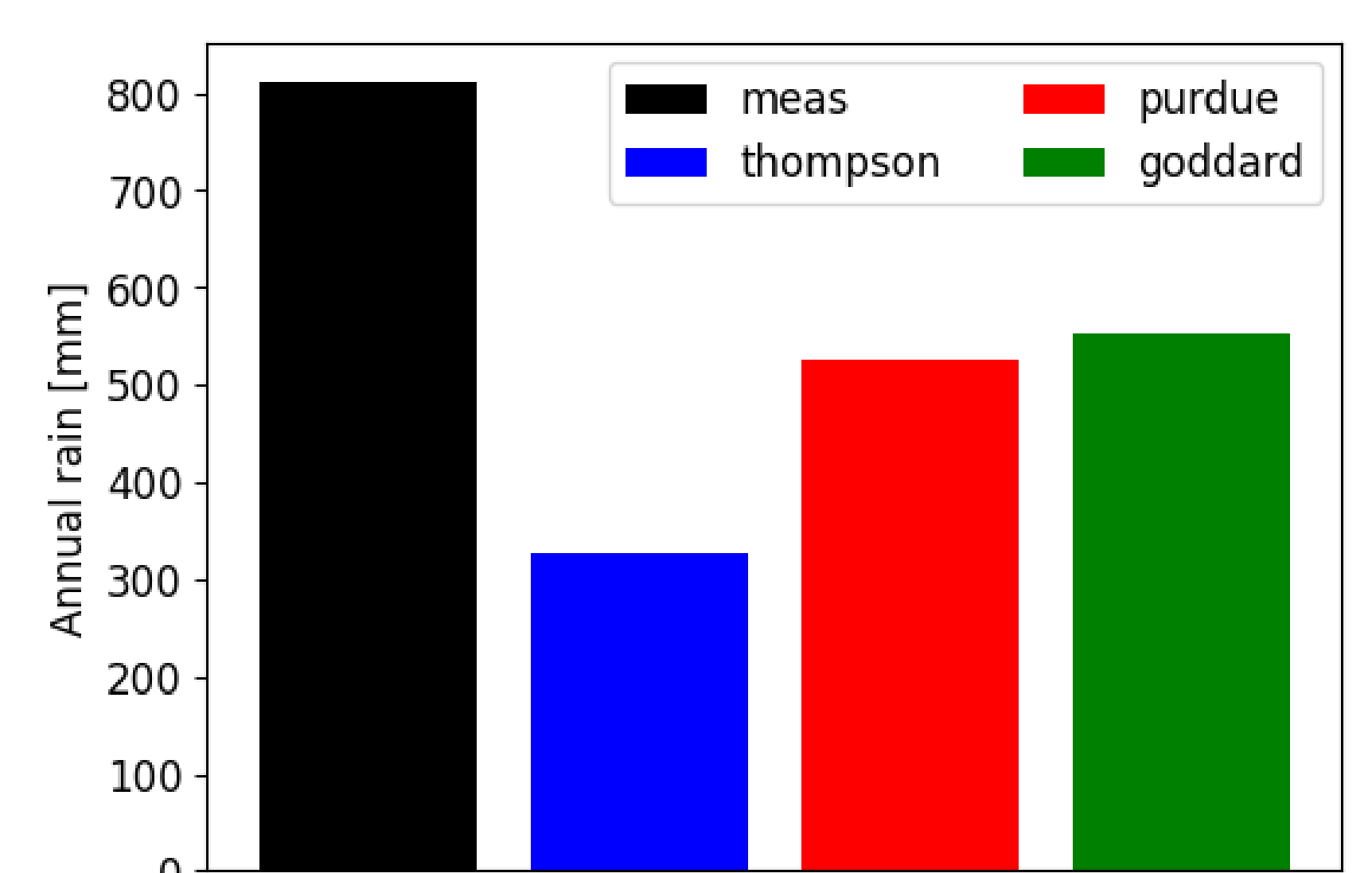
WRF domains



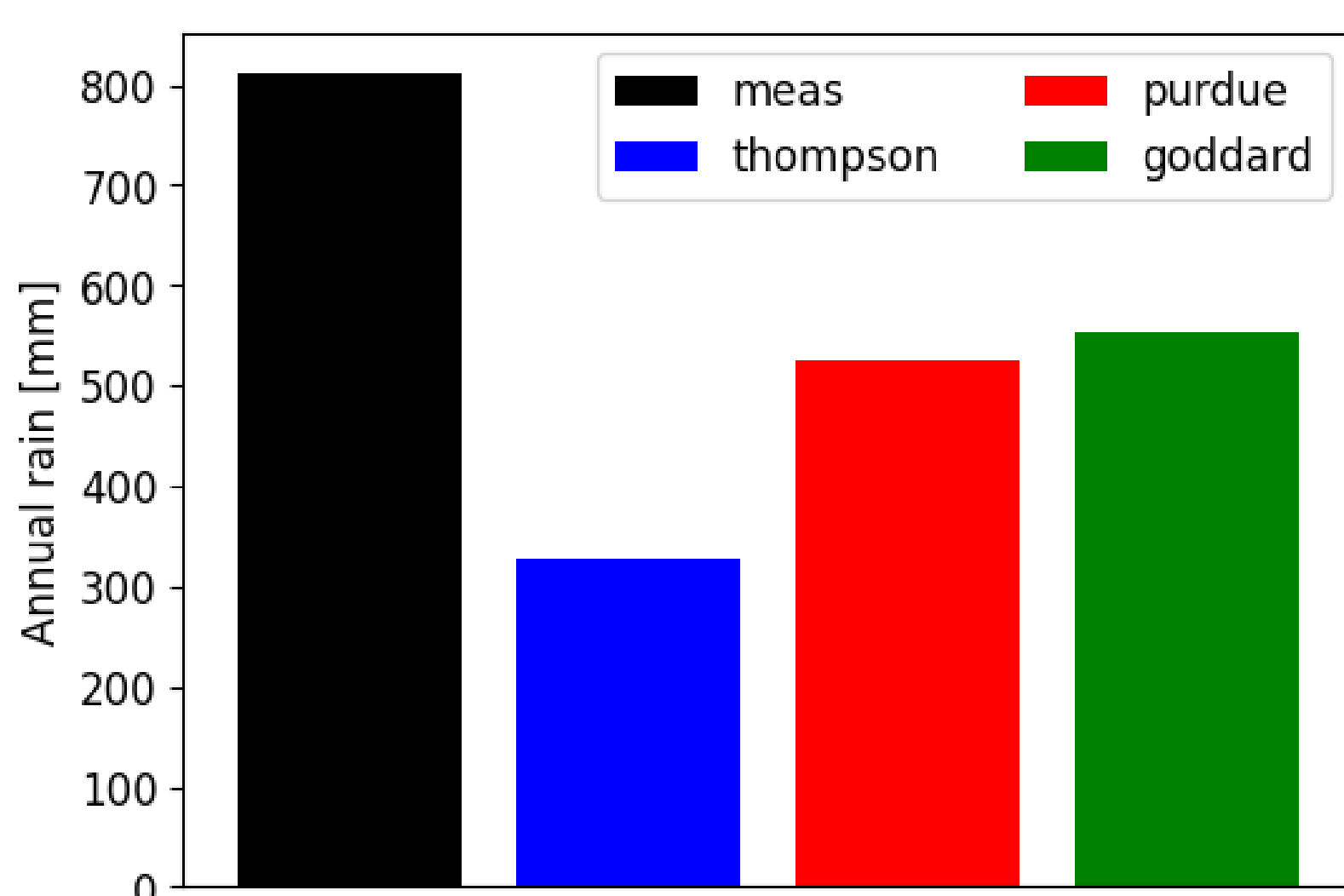
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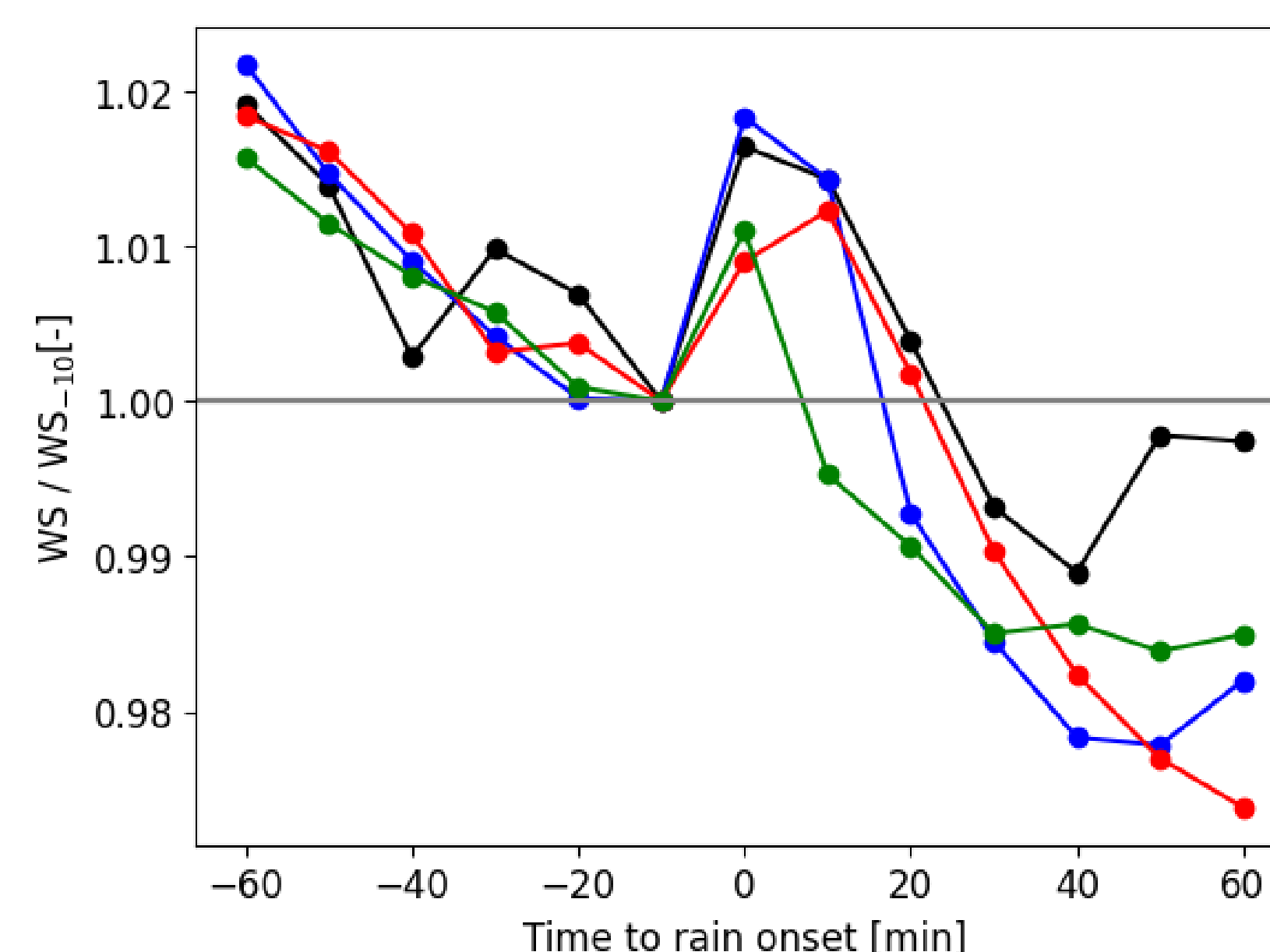
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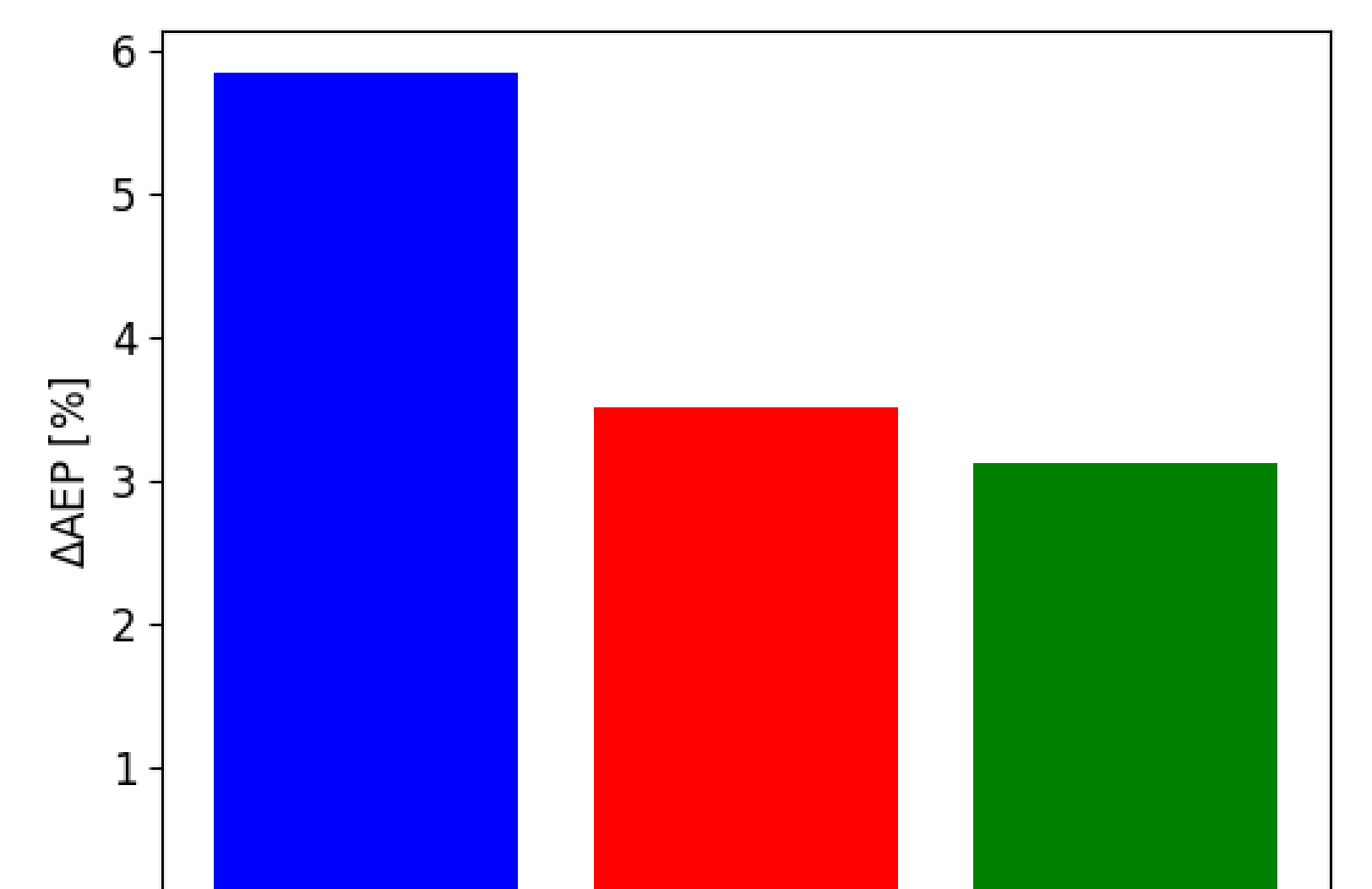
Left: Number of hours that have recorded rain. Middle: Frequency of occurrence of rain intensities. Right: Annual sum of rainfall in mm. Black indicates measurements, colors three different microphysics schemes.



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Left: Annual sum of rainfall in mm. Middle: Average wind speed for events with at least 60 min of continuous rainfall preceded by at least 60 min of no rainfall. Right: Difference in NREL 5MW annual energy production estimates when calculated from modeled versus measured wind speeds.