Development of Climate-Modified IDF Curves for Maryland

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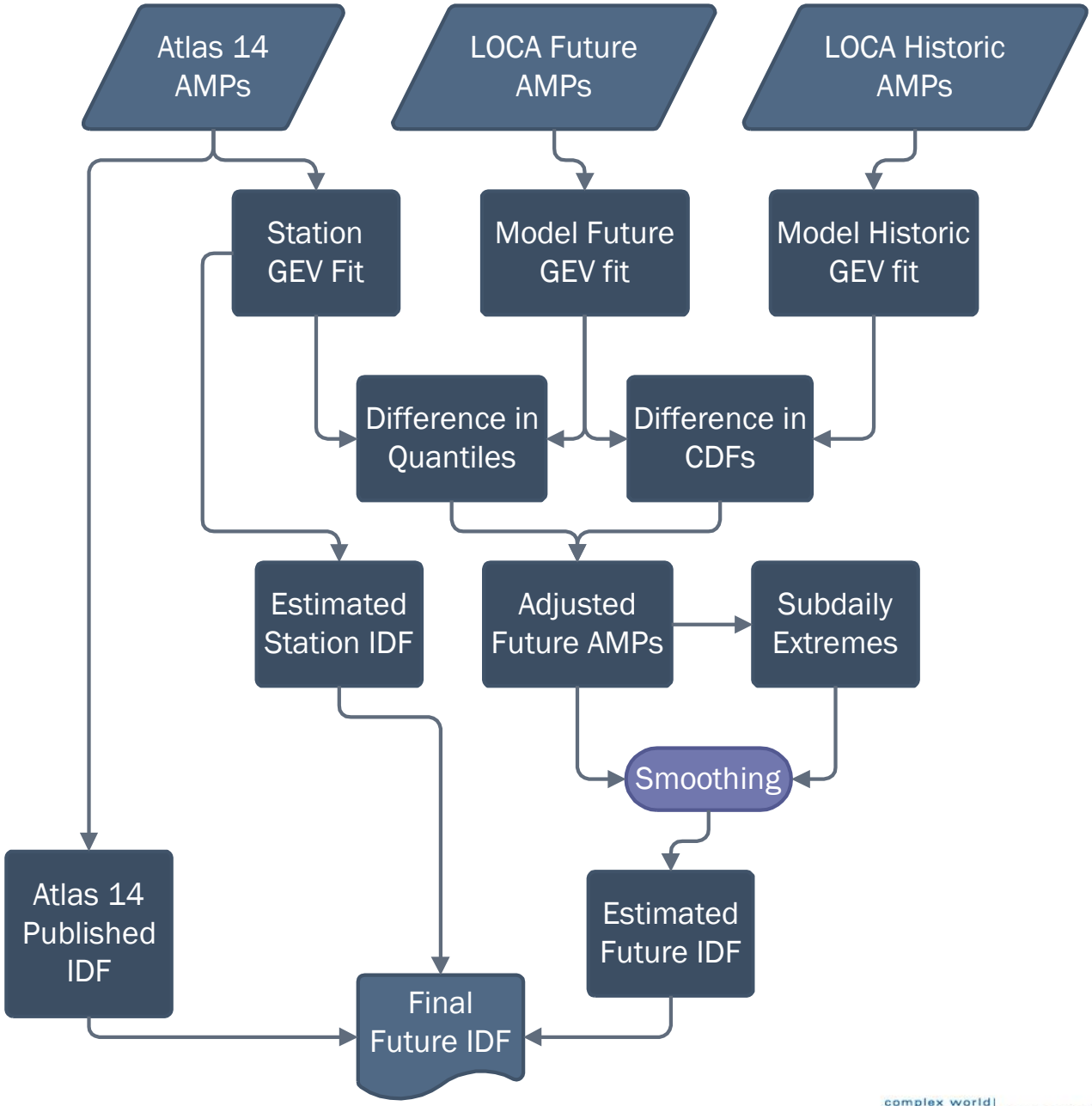
Project Scope

- Develop precipitation Intensity-Duration-Frequency (IDF) curves for future climate across MD
- Develop corresponding urban runoff rates with and without gray and green BMPs
- Evaluate implications for BMP design, pollutant load reduction, and restoration design resilience

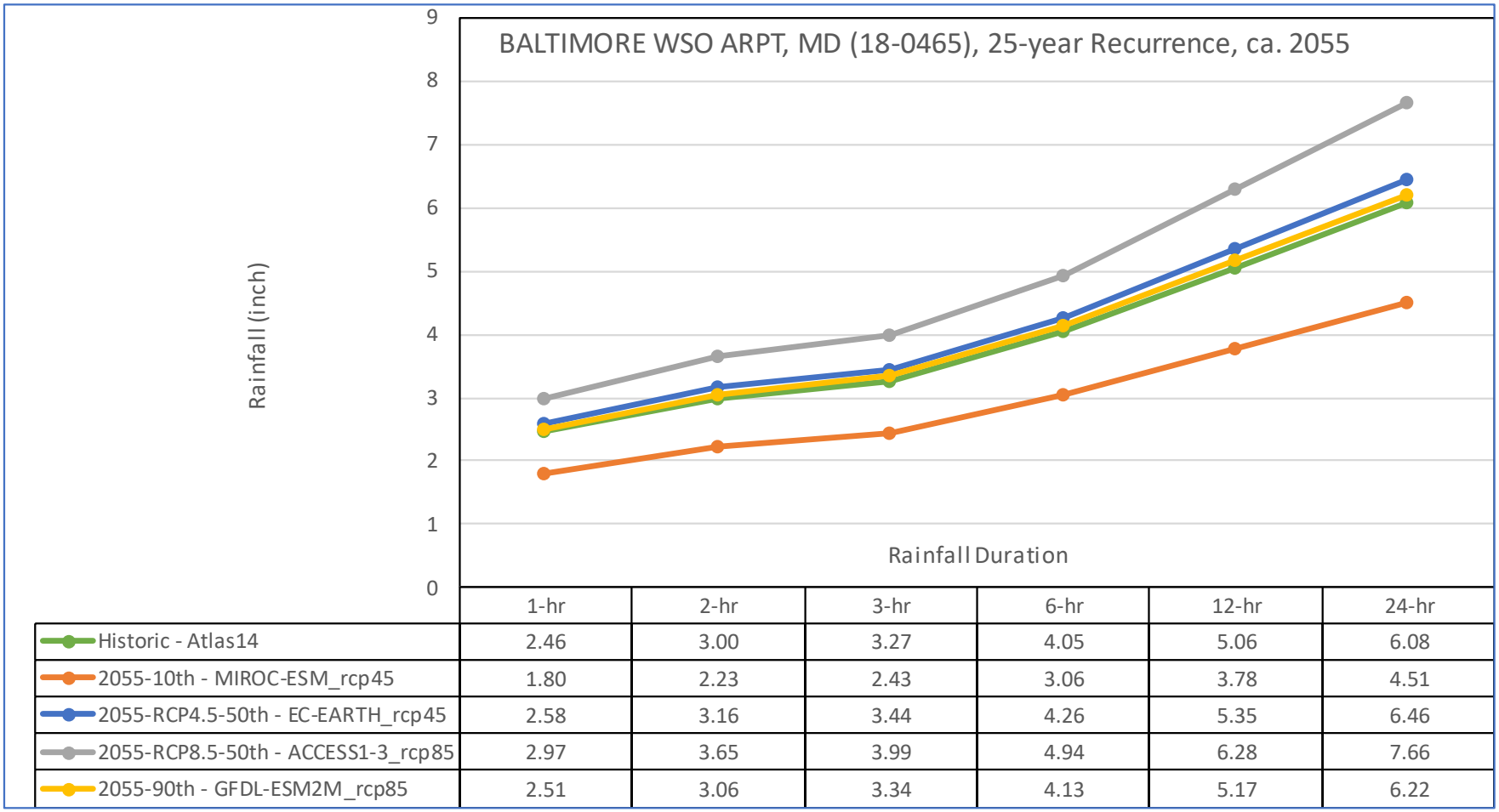
Technical Approach

- Our approach differs from many other IDF efforts
  - Don't rely directly on GCM or RCM-based prediction of extreme events
  - Replicate NOAA Atlas 14 IDF methods (AMP-based)
  - Use LOCA statistically downscaled daily GCM output
  - Map relative change in AMP distribution functions between historic and future conditions in downscaled GCM output to NOAA maxima series using EQM and recalculate IDF
  - Map changes by quantiles with correction for changes in shape of cumulative distribution function over time

IDF Updating



Mid-Century IDF Curves for 50-yr Event, Baltimore

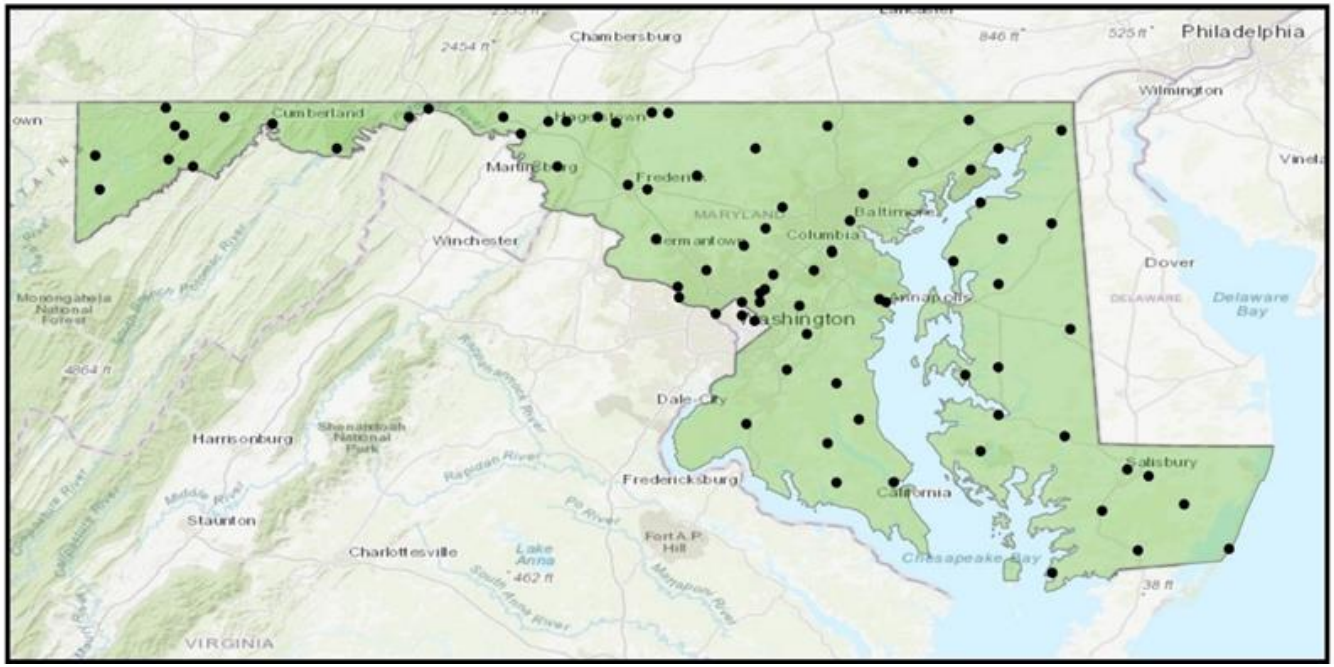


	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr
Historic - Atlas14	2.46	3.00	3.27	4.05	5.06	6.08
2055-10th - MIROC-ESM_rcp45	1.80	2.23	2.43	3.06	3.78	4.51
2055-RCP4.5-50th - EC-EARTH_rcp45	2.58	3.16	3.44	4.26	5.35	6.46
2055-RCP8.5-50th - ACCESS1-3_rcp85	2.97	3.65	3.99	4.94	6.28	7.66
2055-90th - GFDL-ESM2M_rcp85	2.51	3.06	3.34	4.13	5.17	6.22

Displayed GCMs Represent Range of Change in Annual Rainfall Volume

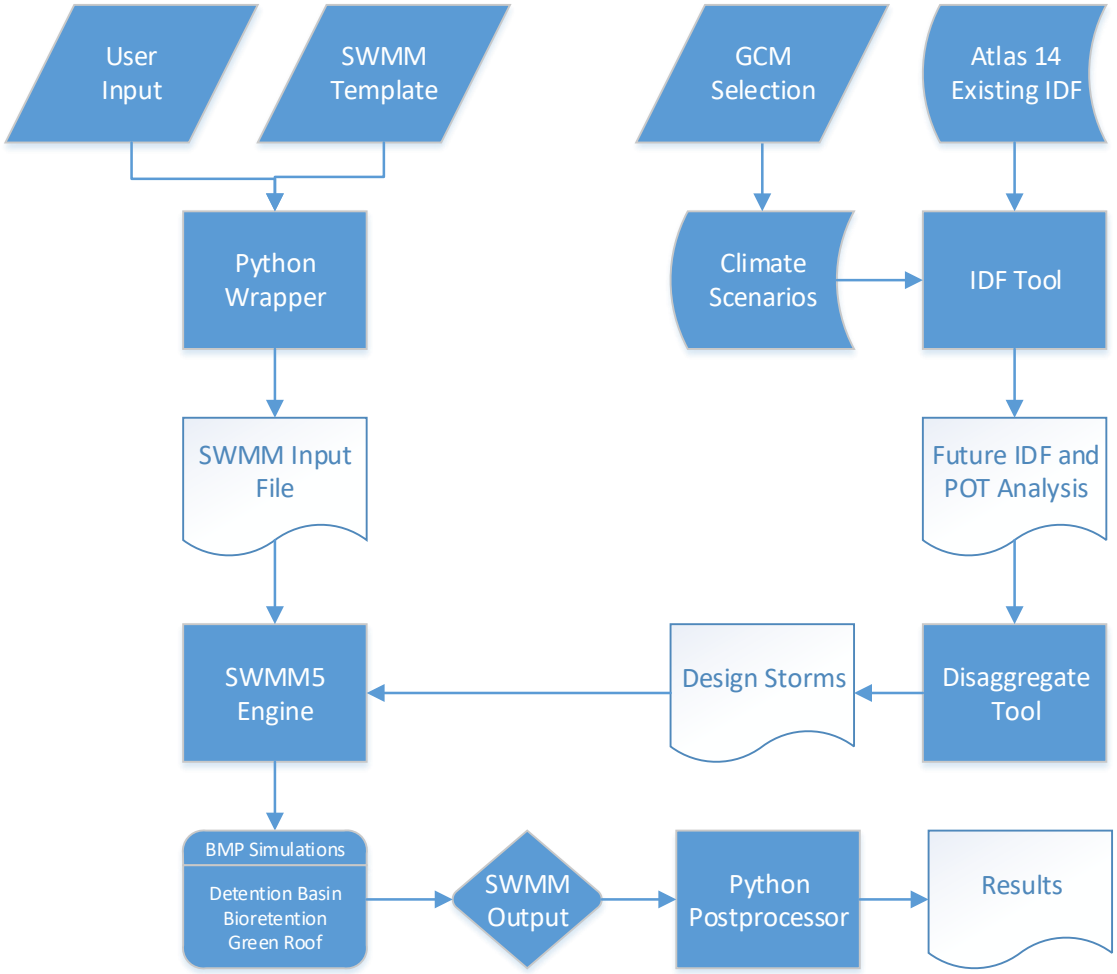
Application

- Generate Future IDF Curves for all Atlas 14 sites in MD
  - Mid-century, Late-century
  - RCP 4.5+8.5: 10th, central, 90th percentile precipitation change



Enhancements

- Peaks-over-threshold analysis for 90th percentile event
- Linkage to SWMM to simulate runoff IDFs and BMP performance



Method Summary

- Automated in Python
- Quick, efficient
- Readily assimilates other sources of data (e.g., CMIP6, MACA, other downscaling products)
- Current results start the conversation about adaptation needs, but are conditional on LOCA

Primary Work Products

- Spatial coverages and database of potential future precipitation IDF curves (in/ivl)
- Spatial coverages and database of potential future urban runoff IDF curves (in/ac/ivl)
- White paper on implications for Climate Adaptation Design
- Technical journal articles (forthcoming)