A Decision Support Tool for Assessing the Climate Change Impacts on Local Rainfall Extremes: SDExRain

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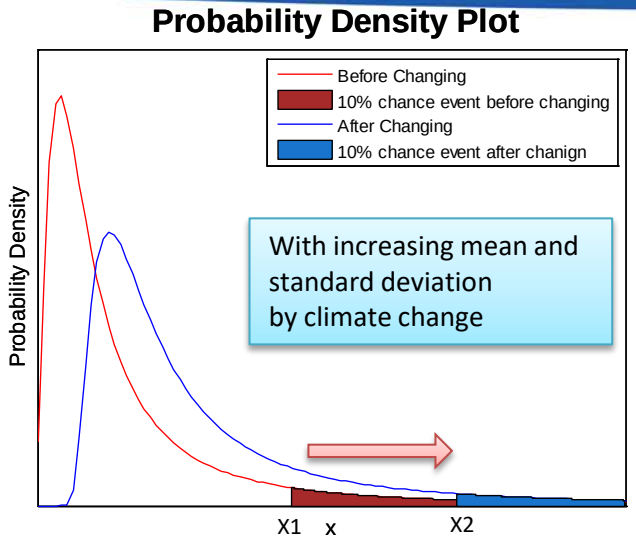
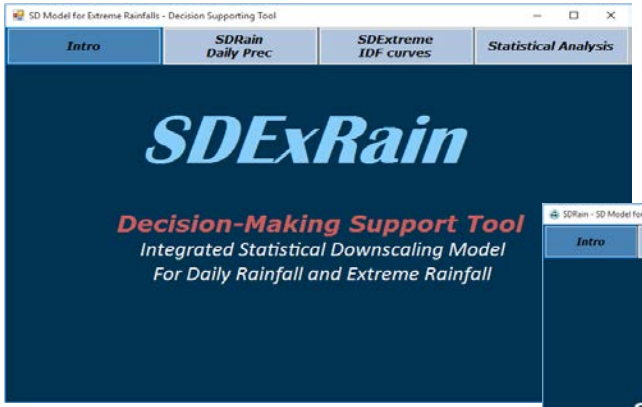
Outline

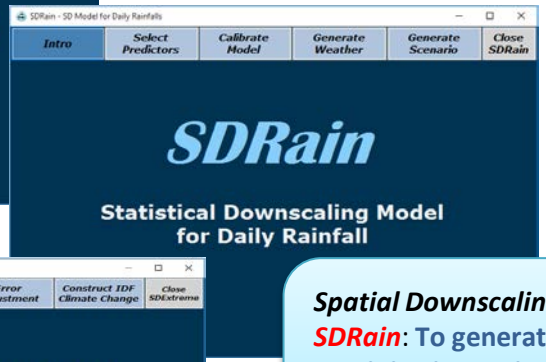
- Why and what is SDExRain?
- Feasibility tests of SDExRain
- Application to the selected stations in Ontario

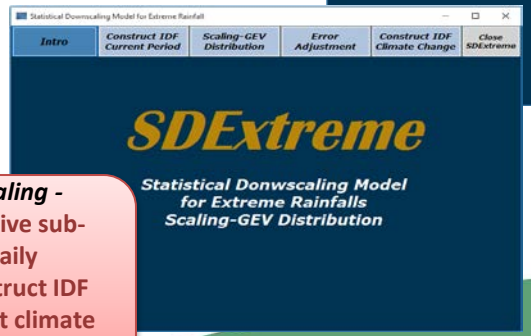
Why & what is SDExRain?



- X1 Events will occur more frequently.
- For same chance events, increasing amounts (x1 ⇒ X2)







Spatial Downscaling - SDRain: To generate daily precipitation series and daily annual maximum precipitations (AMPs)

Temporal Downscaling - SDExtreme: To derive sub-daily AMPs from daily AMPs and to construct IDF curves for different climate change scenarios

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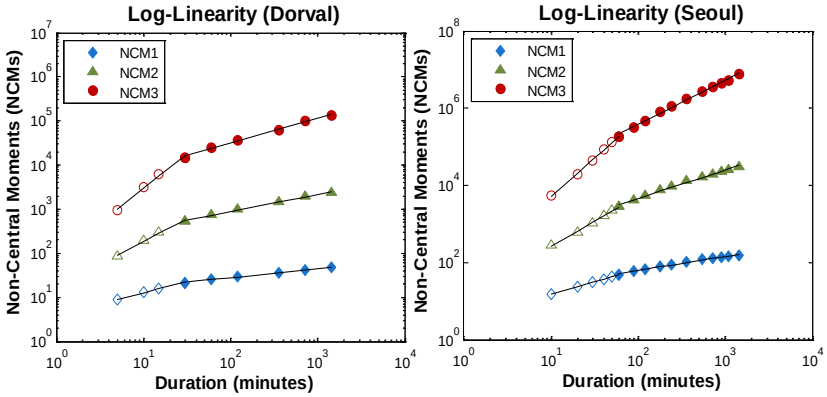
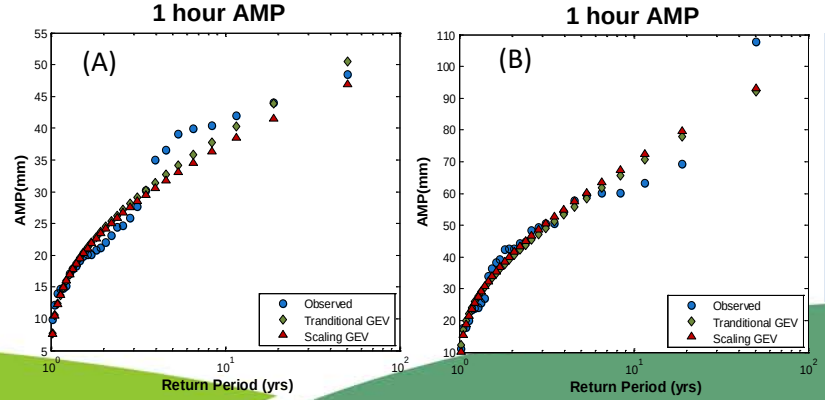
Feasibility Test

- **Two stations with different climatic conditions**
  - **Dorval Airport (Canada): cold region**
  - **Seoul (South Korea): sub-tropical region**
- **Data sets**
  - **NCEP re-analysis**
  - **Observed daily AMPs data available at two selected stations**



Log-log plots of the first three Non-Central Moments (NCMs) against durations for Dorval and Seoul Stations.



Probability plots of 1-hour observed and estimated AMPs using traditional and scaling GEV distributions for the 1961-1990 for Dorval (A) and Seoul (B) stations.

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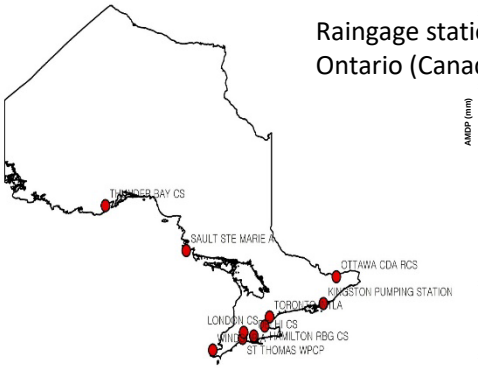
Application



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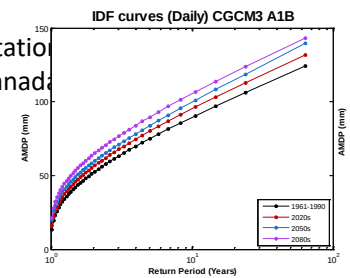

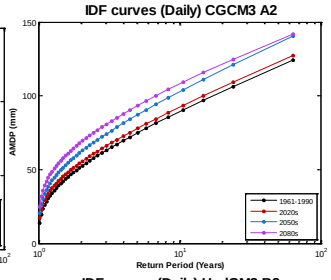

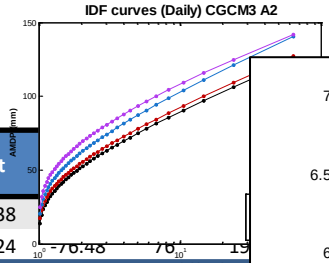

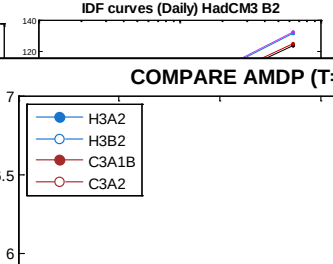

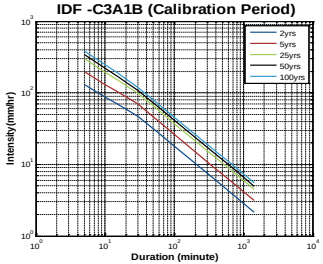

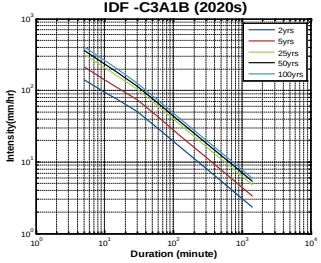

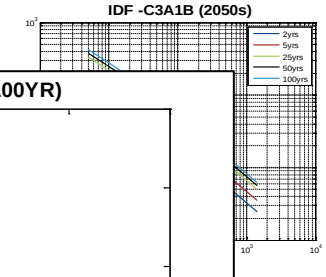

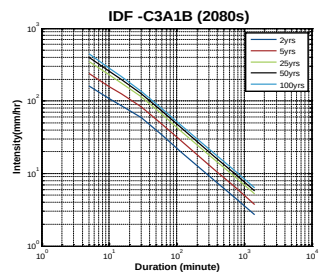

Station ID	Station name	Lat			
6105978	OTTAWA CDA RCS	45.38			
6104175	KINGSTON PUMPING STATION	44.24	-76.48	76	19
6137362	ST THOMAS WPCP	42.77	-81.21	209	19
6158731	TORONTO INTLA	43.68	-79.63	173	19
6144478	LONDON CS	43.03	-81.15	278	19
6139525	WINDSOR A	42.28	-82.96	189	19
6057592	SAULT STE MARIE A	46.48	-84.51	192	19
6153301	HAMILTON RBG CS	43.29	-79.91	102	19
6131983	DELHI CS	42.87	-80.55	231	19
6048268	THUNDER BAY CS	48.38	-89.25	199	19

Estimated daily AMPs corresponding to 100-year return period for the current and future periods (2020s, 2050s, and 2080s) for St-Thomas station.

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Conclusion

- A decision support tool (*SDExRain*) was proposed to describe the relationship between large-scale daily climate variables and daily and sub-daily AMPs at a local site.

- Results of the illustrative applications have indicated the feasibility of the proposed tool. Hence, this tool can be used to assess the climate change impacts on extreme rainfall processes for a given site of interest.

- Further studies are planned to apply this tool for other selected study regions.