Urban Drainage: Ideas for Paths Forward
THE DOWNSCALING PROBLEM:

One day in the 21st Century...

Downscaled Original GCM values
Urban drainage adaptations call for better downscaling *or* understanding of extreme precipitation events.

Special requirements:

- Extremes, not means!
- Long enough realizations to support frequency analysis of rare events
- Adequate representations of extreme-event meteorological processes & results

Urban runoff models want:

- High temporal resolution
- High spatial resolution
- High precip resolution
1. History-based Vulnerability Analyses

• Using existing data & stormwater models, map critical vulnerabilities of a city’s stormwater management systems

• The question to climate analysts becomes “How likely are these breaking points to be reached in available climate-change projections & by common sense?”

• *Uses most-realistic, highest-res data*
• “Simply” expands beyond standard design-storm methods
• *Infinite range of possibilities to be explored?*
• *Minimal connections to specific clim-chg projections*
2. Severe-Storm Condition Evaluations

- Focus on the specific storm types that challenge the stormwater systems most *(describing them in large-scale meteorological terms rather than “just” by intense precip)*

- The question to climate analysts becomes *“What sort of changes are projected in frequency & intensity of these storm types?”*

- Focuses on best aspects of GCMs (general circulation models)
- Natural extension of historical vulnerability analyses
- Reduces range of possibilities to be explored
- Direct connections to specific clim-chg projections, without undue belief in uncertain details
“Semi-quantitative characterization” of a particular category of West Coast extreme storm events: Atmospheric Rivers in IPCC AR4 projections

Dettinger, in press, JAWRA
3. High-resolution Simulations and Downscaling

• Continue along the developing path of “dynamical downscaling,” using advances in that field as they emerge

• The question to climate analysts becomes “What precipitation extremes are projected at finest scales obtainable?”

• Provides detailed examples of extremes that might be faced
• Support may be necessary to ensure focus on stormwater-info needs (most focus remains on average changes)
• Direct connections to specific clim-chg projections
• Technology is still developing & expensive
• Short simulations provide little basis for freq-analysis of rare extremes
Other research needs/options:

Massive-ensemble regional downscaling (RegCPDN)
  - Tens of thousands of years of simulations on 25-km grids, outputting (among other things):
    - Maximum daily P each year
    - 10-year maximum P within 3 consecutive days
    - Number of days with P > 3 thresholds over 10yr windows

Statistical downscaling
  - Many advantages (speed, bias correction, ...)
  - Revisit/revalidate/redesign(?) statistical downscaling with extreme, rare events as focus
Notice that RCP8.5 is more extreme than A2 and by end of century more like A1Fi (see slide #1)

A1b “approximates” RCP6.0

B1 “approximates” RCP4.5 at this global-aggregated scale.