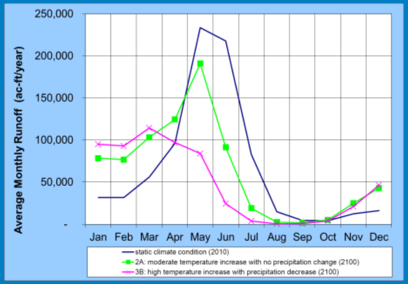


Applications

NA-CORDEX

David Behar

Climate Program Director

San Francisco Public Utilities Commission

CORDEX Planning Meeting

Boulder

February 20, 2013

San Francisco
Water Power Sewer
Services of the San Francisco Public Utilities Commission

CORDEX Framework

Giorgi, F, C. Jones, G. Asrar. 2009. "Addressing climate information needs at the regional level: the CORDEX Framework." WMO Bulletin 58

"A complementary role of CORDEX is to bridge the existing gap between the climate modeling community and the end-users of climate information. This can be achieved by increasing communication across these two communities and by targeting the structure of the CORDEX experimental and data-management activities to facilitate the use of common standards and formats that will enhance more effective and greater use of the resulting climate information by the end-users."

San Francisco Water Power Sewer

CORDEX Applications Committee

David Behar
San Francisco Public Utilities Committee

David Yates
NCAR

Jonathan Winter
Columbia/AgMIP

Laurna Kaatz
Denver Water

Gregg Garfin
University of Arizona

Joe Barsugli
Univ of Colorado/WWA

Alex Ruane
NASA/AgMIP

Caspar Ammann
NCAR

CORDEX Applications Committee

Work Products to Date:

1. CORDEX Decision Makers Outreach Targeting List
2. Draft Decision Maker Questionnaire
3. Literature Review: Practitioner needs for output from climate models

Decision Makers Database

Sectors:

- Water
- Agriculture
- Urban sector
- Public Health
- Transportation
- Ecosystem
- Energy

Decision Maker Database

98 names across 7 sectors, with contact info

URBAN SECTOR	*excerpt*				
Wiegert	Karen	City of Chicago	Karen.Weigert@cityofchicago.org		Chief Sustainablity Officer, in charge of all things climate change. Ref: Joyce Coffee
Jines	Beth	City of Los Angeles			101 city (approx) adaptation planning effort with LA in lead.
MacLeod	Dave	City of Toronto	dmacleao2@toronto.ca	(416) 392-4340	
Rosenzweig	Cynthia	New York Panel on Climate Change	crosenzweig@giss.nasa.gov	(212) 678-5562	Also: Alan Cohn; Bill Solecki
Reeder	Spencer	Cascadia Engineering	spencer@cascadiaconsulting.com	(206) 449-1102	Working with cities
Wilson	Wally	City of Tucson	wally.wilson@tucsonaz.gov	(520) 791-8050, ext. 1414	Tucson Water; chief hydrologist

Decision Maker Questionnaire

What particular vulnerabilities were you investigating when you were seeking climate projection information?

Did your organization have assistance selecting the information or did you make the decision internally?

How would you describe the process of accessing the data?

What was the technique used in developing the projections data that you used (GCM, statistical downscaling, regional climate modeling, etc)?

How was the data made accessible to you?

What format did you receive the data in for your use? (netCDF, ASCII, spreadsheet)

Was there a process to convert projection data into a format usable for your analysis?

Which specific projection datatsets did you use?

- BCSD
- BCCA
- MACA
- NARCCAP
- Other (describe)

Decision Maker Questionnaire

Did your organization have assistance analyzing the information or did you analyze the data internally?

What climate variables did you use?

What was the spatial scale of the data?

What was the temporal scale of the data?

Did you need to do any processing to make the data usable, including adjusting spatial or temporal scales and bias correction? Describe.

What projection time slice(s) did you use in your analysis (i.e. what is the timeframe of your analysis: next 30 years, mid-century, end of century)?

Was what you used satisfactory to you?

Which emissions scenarios did you use in your analysis (SRES/RCP)?

Was what you used satisfactory to you?

Did you need to to any data processing to get to these scales to make it usable, and if so what was the process?

Agriculture – Florida Citrus

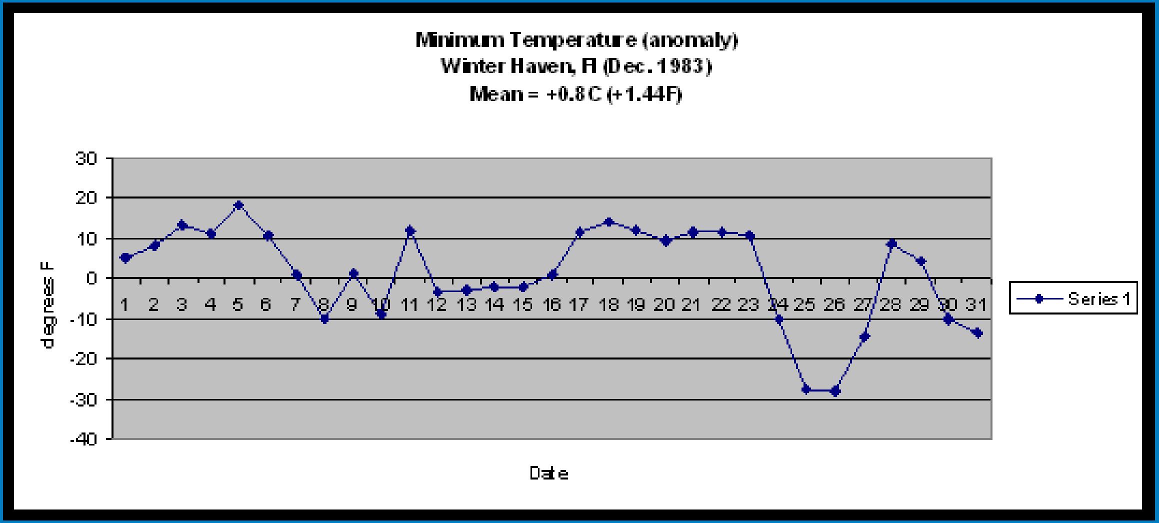
Extremes matter

December 1983 Florida Freeze

Monthly mean above normal

Two cold days ~15◦ below avg

Killed >80% oranges, >50% of trees



Grotjahn, Richard. n.d. "Weather and Climate Extremes on Irrigated and Specialty Agriculture." Atmospheric Science Program, Dept of L.A.W.R, University of California, Davis

California Agriculture: Commodity Sensitivities

- Dairy:
  - Productivity declines 2% each 1C above 22C (72F)
  - THI >90 results in 20% drop in milk production
- Greenhouse/Nursery:
  - Tmax >90F foliage/yield loss, >100F deadly
- Tree nuts:
  - Warmer winters lead to lower yields
  - Wind >20m/s results in blow downs and windfall loss in Pistachio
- Stone Fruits
  - Tmax >55F during bloom, no pollination
  - Higher tems March/April lower yeilds/smaller fruit size
  - Tmin >20-24C causes following year problems for cherries, peaches, nectarines
- Strawberries (Central Cst)
  - T>75F – productivity drops. Ideal: 55-70F
- Tomatoes
  - Production, pollination fails at >40C

Grotjahn, Richard. n.d. "Weather and Climate Extremes on Irrigated and Specialty Agriculture." Atmospheric Science Program, Dept of L.A.W.R, University of California, Davis

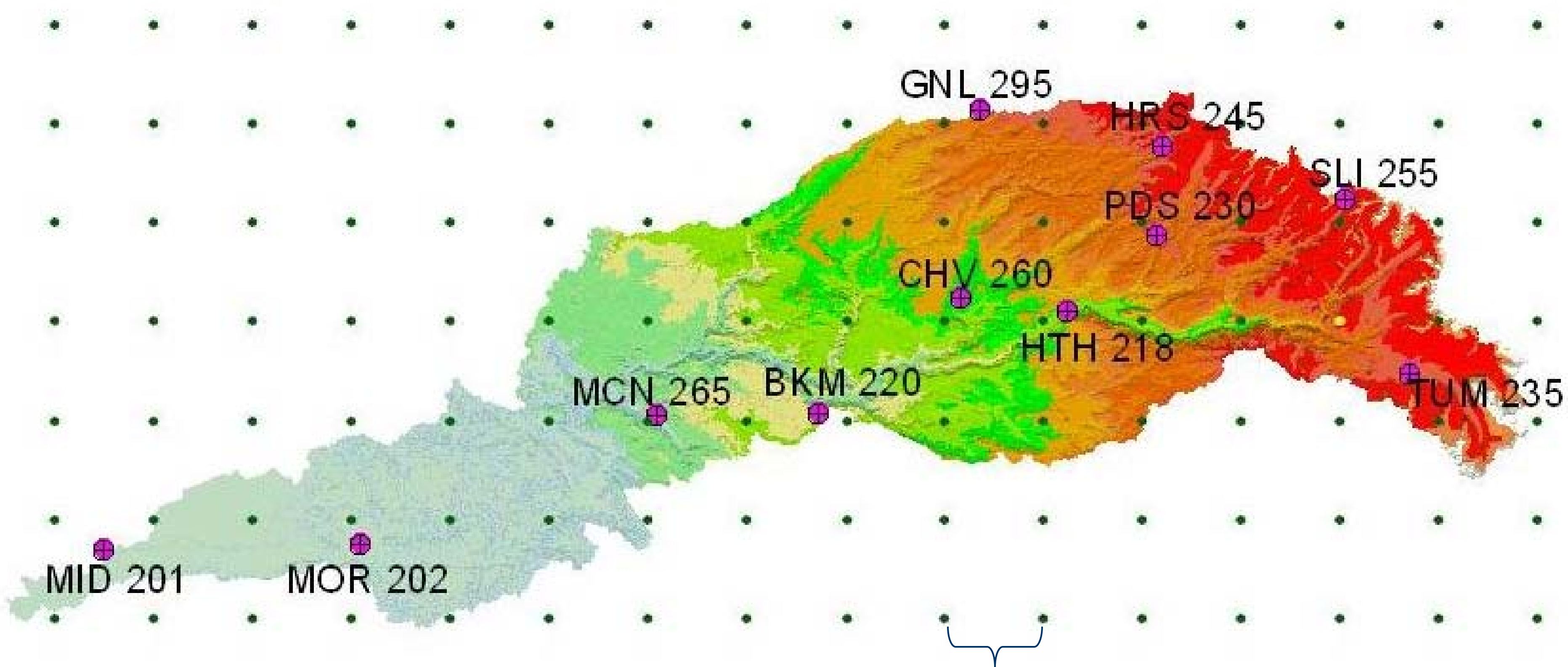
Water Managers – Downstream Models (hydrologic, operations)

Utility	Primary utility model	Geographic scale (min)	Geographic scale (max)	Time scale (input)	Time scale (output)
Denver Water	PACSM	2.6 km2 (470 unequally spaced model nodes)	26,000 km2 (entire modeled region)	Daily (diversions, streamflow, demand, etc.)	Daily, monthly, and annual (streamflow)
New York City Department of Environmental Protection	GWLF, VSLF, CEQUAL-W2, UFI 1-D reservoir eutrophication, OASIS	25 km2 (for water quality modeling)	5,100 km2 (entire modeled region)	Daily and hourly (temperature and precipitation, solar radiation, wind speed, and direction, humidity)	Daily (streamflow, nutrients and sediment loads, dissolved particulates, turbidity, phytoplankton, reservoir levels, and system status)
Portland Water Bureau	DHSVM	150-m grid boxes	370 km2 (watershed)	Daily (temperature, precipitation, and demand)	Daily (streamflow)
San Francisco Public Utilities Commission	HH/LSM	4 mi2 (Pilarcitos reservoir watershed in Peninsula)	1,200 km2 (Hetch Hetchy Reservoir watershed)	Monthly (runoff)	Monthly (reservoir levels, etc.)
Seattle Public Utilities	SEAFM/ HFAMII	< 1 km2 (unequal model nodes)	203 km2 (Masonry Dam watershed on Cedar River)	Daily minimum/ maximum for temperature and total for precipitation	Hourly/daily (streamflow, reservoir levels, etc.)
Southern Nevada Water Authority	CRSS	Unknown, but probably specific hydrographic basins	Entire Colorado River basin	Daily and monthly (temperature, precipitation, and wind speed)	Monthly and annual (streamflow and evaporative loss)

CRSS = Colorado River Simulation System; DHSVM = Distributed Hydrology, Soil-Vegetation Model; GWLF = Generalized Watershed Loading Function model; HH/LSM = Hetch Hetchy/Local Simulation Model; OASIS = a proprietary model developed by HydroLogics; PACSM = Platte and Colorado Supply Model; SEAFM/HFAMII = Seattle Forecast Model/Hydrocomp Forecast and Analysis Modeling System II; VSLF = Variable Source

SFPUC Scale: Hetch Hetchy Watershed

11 stations



1/8 deg

New South Wales Regional Modeling Project

Based on stakeholder meetings and expert judgment (Climate Change Research Center, Univ of NSW) regional modeling outputs will be:

Variables:

1. 2-metre temperature (& hourly)
2. Daily maximum 2-metre temperature
3. Daily minimum 2-metre temperature
4. Precipitation (peak 5, 10, 20, 30, 60min; total 1 hour)
5. Surface pressure
6. 2-metre specific humidity (& hourly)
7. 10-metre wind speed (peak 10min wind gust) (& hourly)
8. Surface evaporation
9. Soil moisture
10. Snow amount

Emissions Scenario Selected: A2

Temporal Scales:

3-hourly for all variables except

Precipitation
2 metre temperature
2 metre humidity
10-metre winds

Which will be output *hourly*

San Francisco Water Power Sewer

On Uncertainty

"…the uncertainties in regional climate change projections need to be fully characterized and, where possible, reduced. This requires the generation of ensembles of simulations exploring all the relevant uncertainty dimensions…The larger the ensemble, the better the uncertainty space can be sampled and explored."

Giorgi, F, Jones, C, Asrar, G. 2009 "Addressing climate information needs at the regional level: the CORDEX