Climate Change Preparation at the Department of Energy's Savannah River Site

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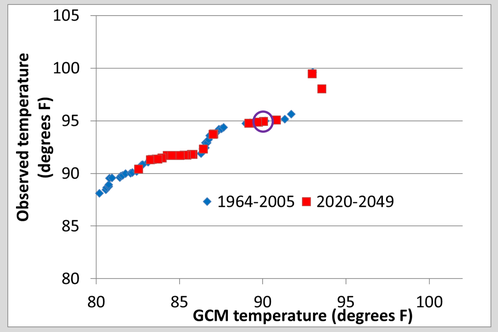
As per federal sustainability requirements, all DOE facilities are directed to prepare for climate change at their respective sites, which must involve 'detailing risk' and 'describing actions to build resilience'. To meet this obligation, the Atmospheric Technologies Group (ATG) at the Savannah River National Laboratory (SRNL) has developed a climate projection for the DOE's Savannah River Site (SRS) near Aiken, SC, and performed a vulnerability assessment describing the specific threat to site assets. The site activities most in danger of being impaired by climate change include the maintenance of indoor temperatures, ensuring the safety of outdoor workers, and maintaining successful operation of site cooling towers. The next phase of the work involves the formation of a climate change group comprising SRS personnel responsible for those operations, with the goal of determining the best way to mitigate the threats. A series of meetings is now ongoing to develop a concrete plan of action.

Goal: Develop a climate vulnerability assessment for the Savannah River Site (SRS).

1. Apply 'statistical downscaling' to existing global climate model (GCM) data to make it consistent with observations at SRS.

Global Climate Models	Organization
CCSM4	Nat. Center for Atmospheric Research (NCAR)
GISS-EH2	Goddard Institute for Space Studies (GISS)
MPI	Max Planck Institute
CanESM2	Environment Canada
CESM	NCAR/DOE
CSIRO	Commonwealth Scientific and Industrial Research Organisation



93rd Percentile GCM value = 90°F

93rd Percentile Observed value = 95°F

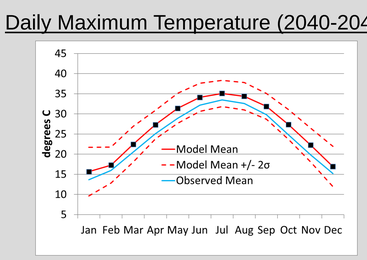
GCM value for July of 2030 = 90°F

Downscaled value for July of 2030 = 95°F

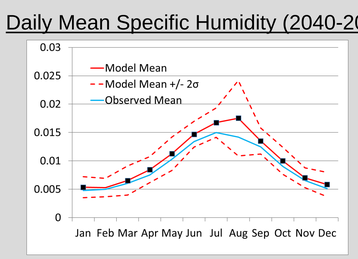
Scatterplot of the observed vs. GCM ranked July mean SRS temperature values for 1964 to 2005 (blue), along with the 2020-2049 values interpolated to the curve (red).

2. Convert future meteorological data into climate indices relevant to site personnel

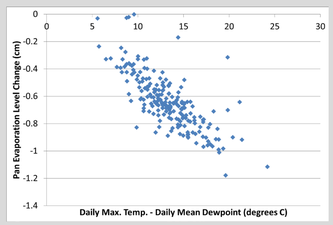
Daily Maximum Temperature (2040-2049)



Daily Mean Specific Humidity (2040-2049)

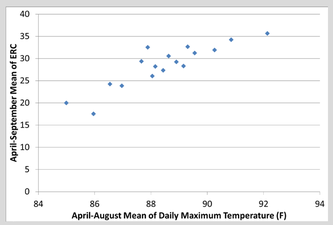


Evaporation

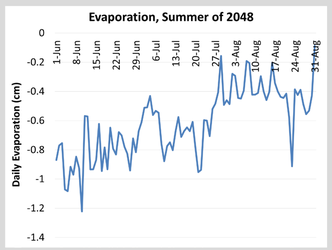


Observed relationship between summer temperatures, dewpoints, and daily evaporation.

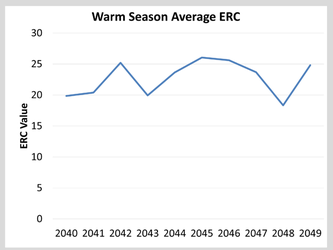
Fire Danger



Observed relationship between temperature and Energy Release Component (ERC).



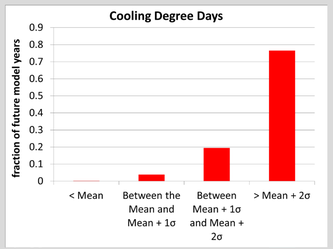
Projected daily evaporation.

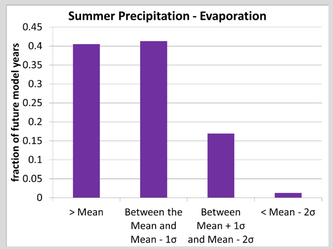


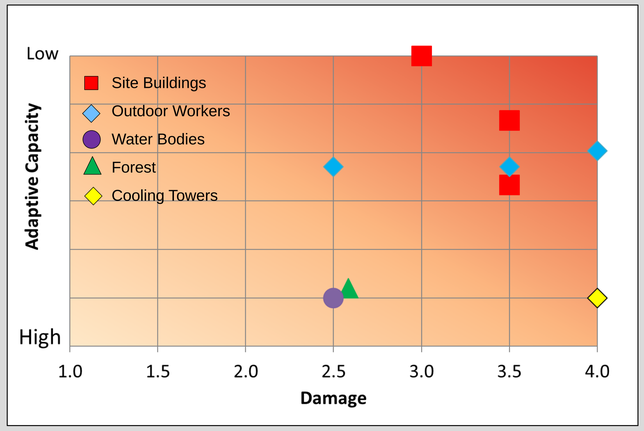
Projected annual warm season ERC.

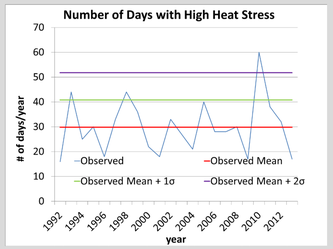
3. Compare these future indices to the current values, and estimate the 'threat' caused by climate change

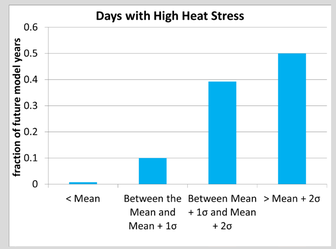
Vulnerability of SRS assets to climate change. Darker shades of red indicate a greater 'vulnerability' score.

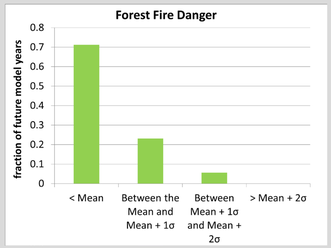


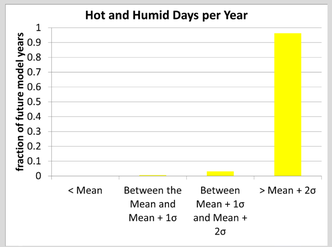












Summary

1) Global climate model data was 'downscaled' to provide a climate projection for the Savannah River Site.
2) The 2040s are characterized by warmer and more humid conditions.
3) These correspond to increases in building cooling cost, outdoor worker heat stress, and compromised cooling tower operation.
4) Increases in fire danger and hazardous decreases in lake and pond levels are not expected.

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