ClimateWNA (http://cfcg.forestry.ubc.ca/projects/climate-data/climatebcwna/): generating high-resolution climate data for climate change studies and applications in Western North America

ClimateWNA is an application written by Dr Tongli Wang (http://cfcg.forestry.ubc.ca/people/tongli-wang/) that extracts and downscales 1961-1990 monthly climate normal data from a moderate spatial resolution (4 x 4 km) to scale-free point locations, and calculates monthly, seasonal and annual climate variables for specific locations based on latitude, longitude and elevation.The downscaling is achieved through a combination of bilinear interpolation and dynamic local elevational adjustment. ClimateWNA uses the scale-free data as baseline to downscale historical and future climate variables for individual years and periods between 1901 and 2100.

Data sources

Baseline data

The monthly baseline data for 1961-1990 normals were compiled from the following sources and unified at 4 x 4 km spatial resolution:

1. British Columbia: PRISM at 800 x 800 m from Pacific Climate Impact Consortium;

2. Prairie provinces: PRISM at 4 x 4 km from the PRISM Climate Group (http://www.prism.oregonstate.edu/);

3. United States: PRISM at 800 x 800 m from the PRISM Climate Group (Daly *et al*. 2008);

4. The rest: ANUSPLIN at 4 x 4 km

5. Monthly solar radiation data were provided by Dr. Robbie Hember at University of British Columbia.

Historical data

Historical monthly data were obtained from Climate Research Unit (CRU) (Harris et al 2014). The data version is CRU TS 3.23. The spatial resolution is 0.5 x 0.5° and covers the period of 1901-2014. Anomalies were calculated for each year and period relative to the 1961-1990 normals.

Future climate data

The climate data for future periods, including 2020s (2010-2039), 2050s (2040-69) and 2080s (2070-2100), were from General Circulation Models (GCMs) of the Coupled Model Intercomparison Project (CMIP5) included in the IPCC Fifth Assessment Report (IPCC 2014). Fifteen GCMs were selected for two greenhouse gas emission scenarios (RCP 4.5 and RCP 8.5). When multiple ensembles are available for each GCM, an average was taken over the available (up to five) ensembles. Ensembles among the 15 GCMs are also available.

Climate variables used in Seedlot Selection Tool

1) Annual variables:

Directly calculated annual variables:

- MAT mean annual temperature (°C)
- MWMT mean warmest month temperature (°C)
- MCMT mean coldest month temperature (°C)
- TD temperature difference between MWMT and MCMT, or continentality (°C)
- MAP mean annual precipitation (mm)
- MSP mean annual summer (May to Sept.) precipitation (mm)

- AHM annual heat-moisture index (MAT+10)/(MAP/1000))
- SHM summer heat-moisture index ((MWMT)/(MSP/1000))

Derived annual variables:

- DD<0 degree-days below 0°C, chilling degree-days
- DD>5 degree-days above 5°C, growing degree-days
- FFP frost-free period
- PAS precipitation as snow (mm) between August in previous year and July in current year
- EMT extreme minimum temperature over 30 years
- EXT extreme maximum temperature over 30 years
- Eref Hargreaves reference evaporation (mm)
- CMD Hargreaves climatic moisture deficit (mm)

References

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