

The Boon and Bane of Natural Water Storage in Mountains



Carson Peak, Eastern Sierra Nevada, California

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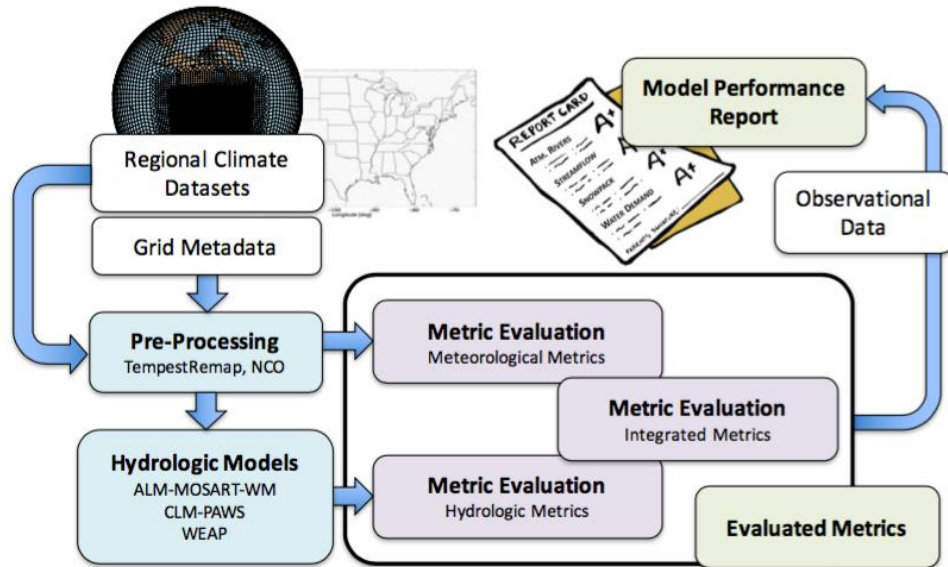
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Overview of Hyperion Project



UNDERSTANDING HYDROCLIMATE DATA WITH USE-INSPIRED METRICS

climate.ucdavis.edu/hyperion



Software pipeline development

Objectives

- Develop multi-metric dataset evaluation toolkit
- Engage water resource managers for decision-relevant metrics
- Provide insight into the usability of climate information
- Identify sources of model error
- Evaluate cutting-edge climate model simulations

Multi-Metric, Multi-Dataset Intercomparison

Z-score error in SWE triangle metric – *underestimate* (*overestimate*)

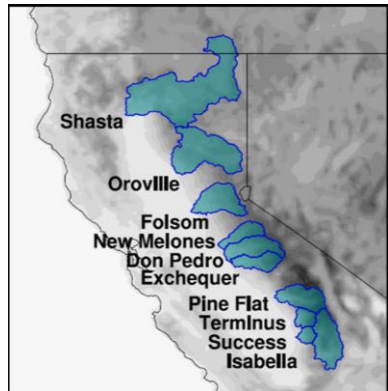
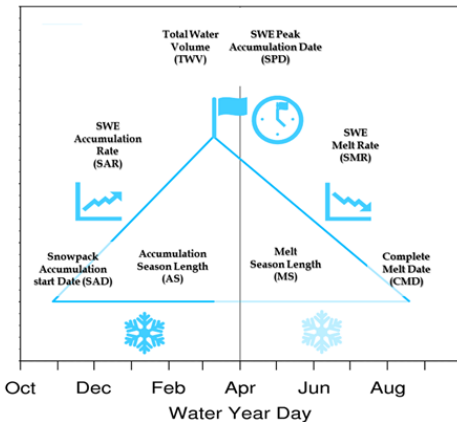


Observationally constrained
snow products

RCM forced by
atmospheric reanalysis

RCM forced by GCM

New GCM technique
(VR-CESM)



Statistical
downscaling
(LOCA)

10 California Regions	SAR	TWV	SMR	SPD	AS	MS
L15 (reference)	0.00	0.00	0.00	0.00	0.00	0.00
NLDAS_2_SAC	-1.58	-1.53	-1.67	0.07	0.08	0.20
NLDAS_2_VIC	-1.40	-1.53	-1.46	-0.61	-0.75	-0.18
ECMWF ERAINT_CRCM5 at 12km	-0.78	-1.03	-0.20	-0.66	-0.92	-0.48
ECMWF ERAINT_CRCM5 at 25km	-0.86	-1.15	1.09	-0.88	-0.86	-0.72
ECMWF ERAINT_CRCM5 at 50km	-1.39	-1.61	2.19	-0.86	-1.11	-1.55
ECMWF ERAINT_CanRCM4 at 25km	-1.44	-1.59	-1.12	-0.66	-0.97	-0.80
ECMWF ERAINT_HIRHAM5 at 50km	-1.08	-1.42	3.03	-1.00	-1.34	-1.39
ECMWF ERAINT_WRF at 12km	-0.68	-1.03	0.12	-0.88	-0.95	-0.67
ECMWF ERAINT_WRF at 25km	-0.81	-1.22	-0.17	-1.09	-1.13	-0.82
ECMWF ERAINT_WRF at 50km	-1.39	-1.70	0.37	-1.09	-1.07	-1.47
CanESM2_CanRCM4 at 50 km	-1.56	-1.80	-1.21	-1.14	-1.19	-0.87
CanESM2_CRCM5 at 50 km	-0.70	-0.89	0.06	-0.52	-0.60	-0.99
MPI_ESM_CRCM5 at 50 km	0.03	0.12	1.05	0.10	0.06	-0.74
MPI_ESM_RegCM4 at 50 km	1.90	1.90	3.18	0.01	-0.27	-0.60
GFDL_WRF at 50 km	0.06	-0.07	1.70	-0.29	-0.54	-0.23
GFDL_WRF at 25 km	1.17	1.22	4.12	-0.07	-0.23	-0.09
HadGEM2_WRF at 50 km	-0.59	-1.07	-0.79	-1.23	-1.24	-0.35
HadGEM2_WRF at 25 km	0.18	-0.44	-0.31	-1.10	-1.01	-0.15
CAL_VR_MG2 at 50km	-1.46	-1.79	0.35	-1.14	-1.28	-1.82
CAL_VR_MG2 at 25km	-0.58	-0.58	0.83	-0.08	-0.50	-0.97
CAL_VR_MG2 at 12km	0.26	-0.20	2.25	-0.62	-0.82	-0.71
CAL_VR_MG2 at 6km	0.11	-0.07	1.90	-0.50	-0.42	0.05
VR28_EPAC_141 at 25 km	-1.58	-1.74	0.91	-0.95	-1.26	-1.95
VR28_EPAC_94 at 25 km	-1.36	-1.57	0.76	-0.68	-1.50	-1.77
VR28_EPAC_47 at 25 km	-1.18	-1.51	2.61	-1.00	-1.46	-2.09
LOCA_ACCESS1_0 at 6km	0.15	0.17	0.42	-0.02	0.10	-0.12
LOCA_ACCESS1_3 at 6km	0.26	0.05	-0.44	-0.33	-0.21	0.60
LOCA_CCSM4 at 6km	-0.10	-0.08	-0.31	-0.04	-0.20	0.22
LOCA_CESM1_BGC at 6km	-0.46	-0.40	-0.51	0.14	0.02	-0.06
LOCA_CESM1_CAM5 at 6km	0.42	0.30	-0.56	-0.32	0.11	1.48
LOCA_CMCC_CM at 6km	-0.06	-0.03	-0.73	-0.08	0.33	1.61
LOCA_CMCC_CMS at 6km	-0.18	-0.20	-0.49	-0.10	-0.27	0.25
LOCA_CNRM_CM5 at 6km	0.20	-0.10	-0.51	-0.45	-0.51	0.41
LOCA_CSIRO_Mk3_6_0 at 6km	-0.06	0.01	-0.74	0.08	0.49	1.08
LOCA_CanESM2 at 6km	0.33	0.14	-0.19	-0.41	-0.32	0.40
LOCA_EC_EARTH at 6km	-0.06	-0.28	-1.16	-0.30	0.39	1.98
LOCA_FGOALS_g2 at 6km	0.34	0.29	-0.56	-0.10	0.23	0.95
LOCA_GFDL_CM3 at 6km	-0.06	-0.21	-0.69	-0.27	-0.40	0.53
LOCA_GFDL_ESM2G at 6km	-0.32	-0.38	-1.03	-0.10	0.25	1.32
LOCA_GFDL_ESM2M at 6km	-0.22	-0.18	-0.77	-0.01	0.42	1.50
LOCA_GISS_E2_H at 6km	0.61	0.50	-0.25	-0.22	-0.09	0.96
LOCA_GISS_E2_R at 6km	0.32	0.19	-0.57	-0.24	0.12	0.89
LOCA_HadGEM2_AO at 6km	0.24	0.14	-0.64	-0.14	0.26	0.98
LOCA_HadGEM2_CC at 6km	0.43	0.47	0.05	0.10	-0.03	0.32
LOCA_HadGEM2_ES at 6km	0.50	0.66	0.42	0.19	0.00	0.16
LOCA_IPSL_CM5A_LR at 6km	0.09	-0.03	-0.82	-0.24	0.01	1.13
LOCA_IPSL_CM5A_MR at 6km	0.23	-0.12	-0.98	-0.45	0.23	1.75
LOCA_MIROC_ESM at 6km	0.74	0.48	-0.41	-0.29	0.17	1.25
LOCA_MIROC_ESM_CHEM at 6km	0.04	0.01	-0.89	0.09	0.62	1.40
LOCA_MIROC5 at 6km	0.21	0.18	2.53	-0.11	-0.21	0.24
LOCA_MPI_ESM_LR at 6km	0.16	0.10	-0.82	-0.13	0.43	1.51
LOCA_MPI_ESM_MR at 6km	0.17	0.21	-0.59	0.11	0.54	1.18
LOCA_MRI_CGCM3 at 6km	0.24	0.09	-0.77	-0.17	0.35	1.27
LOCA_NorESM1_M at 6km	0.03	-0.11	-0.99	-0.18	0.45	1.96
LOCA_bcc_csm1_1 at 6km	-0.09	-0.06	-0.74	-0.01	0.35	1.18
LOCA_bcc_csm1_1_m at 6km	0.57	0.34	-0.59	-0.28	0.15	1.49
LOCA_incm4 at 6km	0.48	0.28	-0.61	-0.05	0.50	1.38

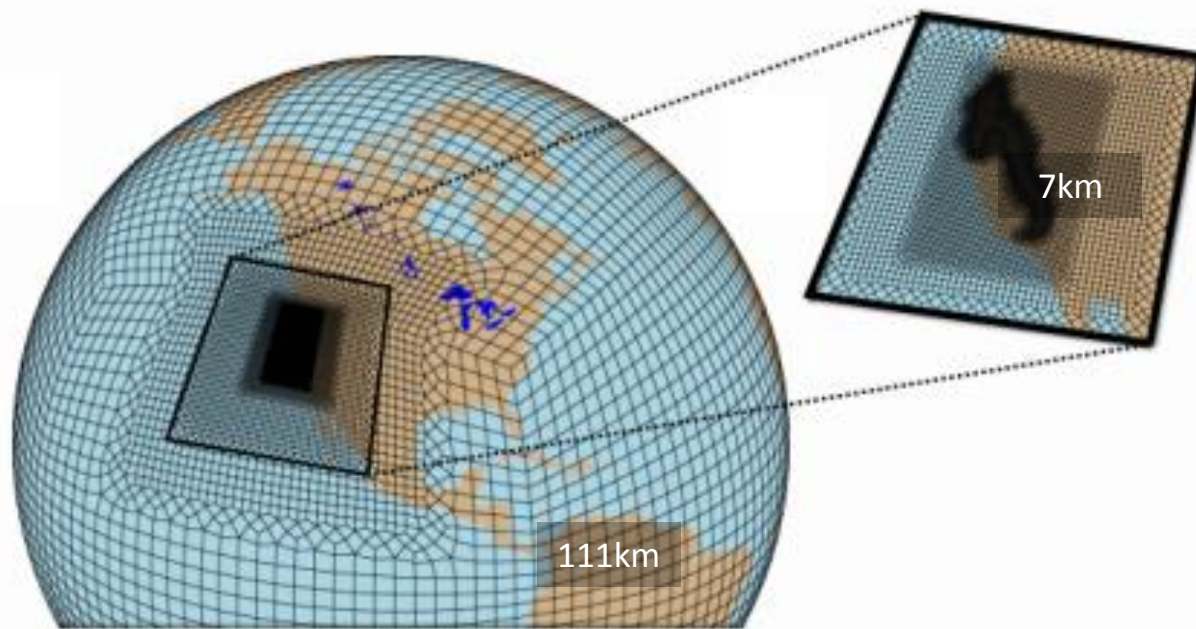
Evaluating Cutting-Edge Global Climate Models

Variable-Resolution in the Community Earth System Model (VR-CESM)

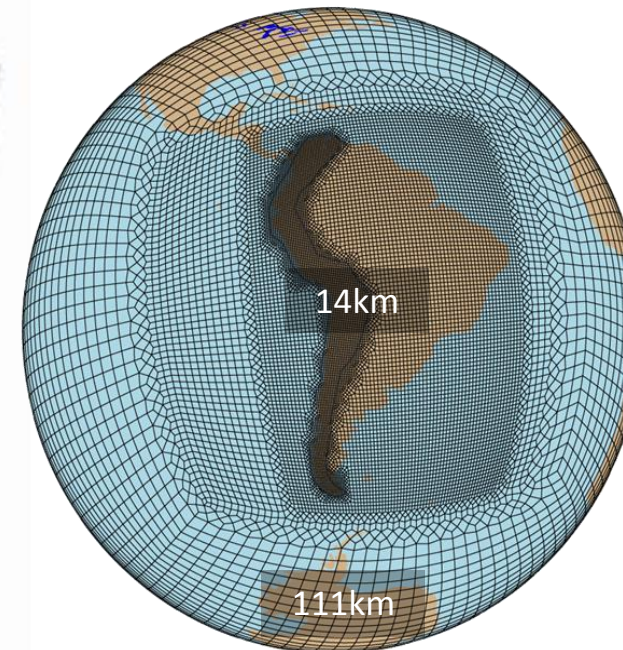
Benefits:

- Global simulation (atmosphere-ocean-land teleconnections)
- Globally conserved energy, mass and momentum (climate simulation)
- Increased resolution in specified areas (better topography)
- Decrease in model runtime and data storage (“smaller” server usage)
- Eliminates multi-model dataset needs (bias propagation)
- Merges regional and global modeling communities (scale awareness)
- Glimpse into the future of high-resolution global climate modeling

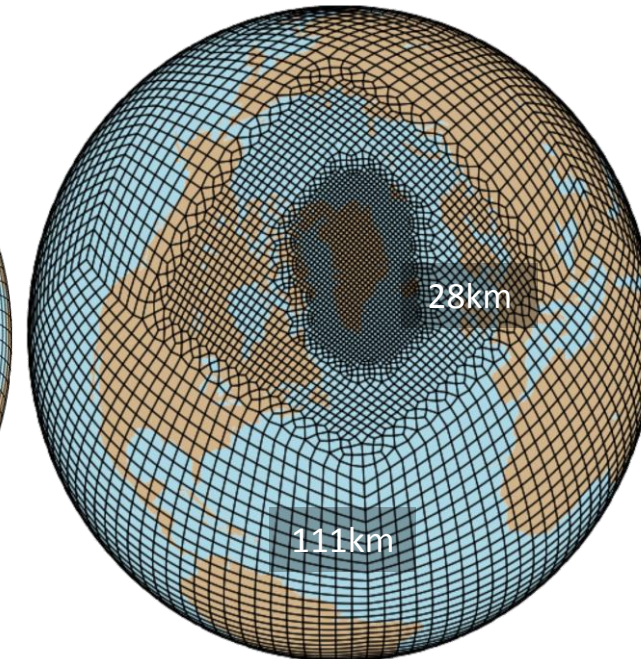
Sierra Nevada and western United States



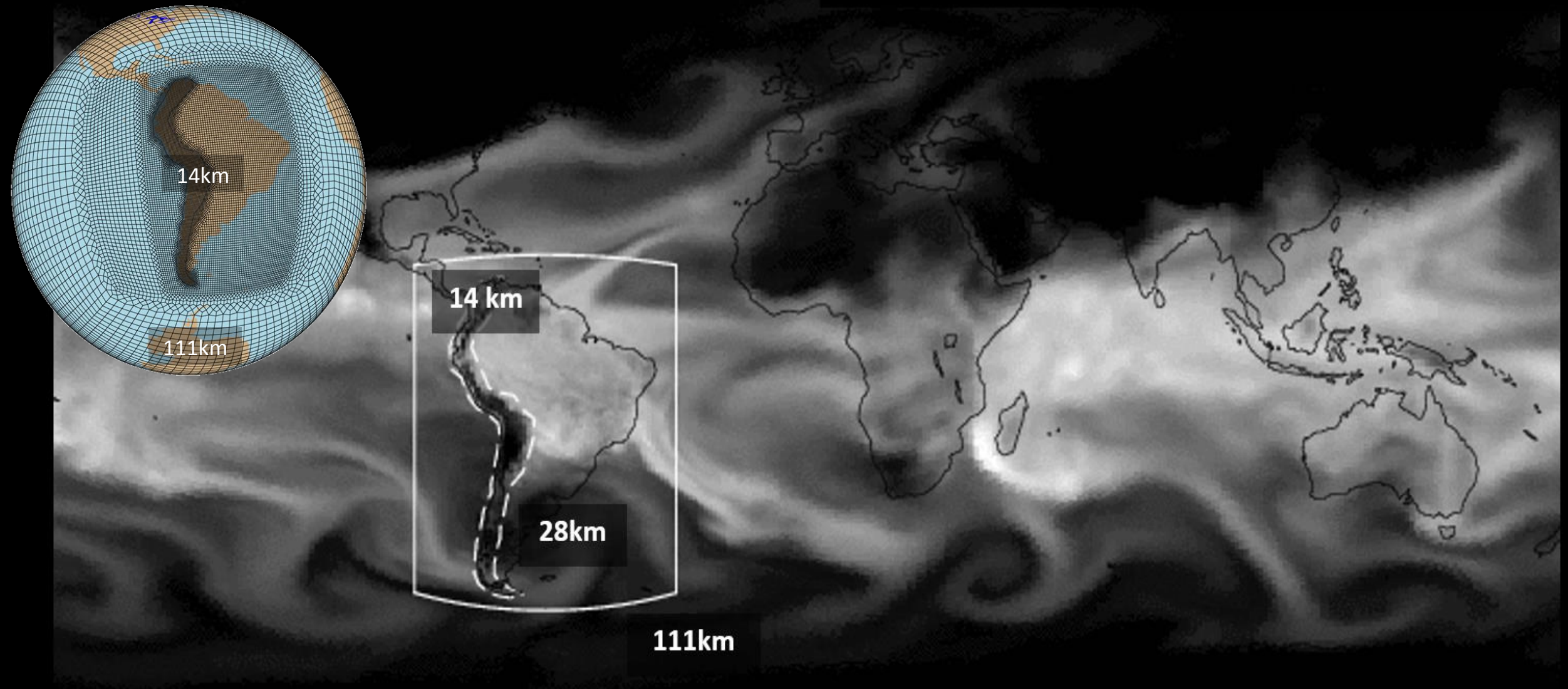
South American Andes



Greenland



Evaluating Cutting-Edge Global Climate Models



The Boon and Bane of Natural Water Storage in Mountains



Carson Peak, Eastern Sierra Nevada, California

Posters WS 1.1.B - Monday, 09/Sep/2019: 5:45pm - 7:00pm

Thank you for listening! I look forward to our conversation at the poster session.

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