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Inland Water Temperature: An Ideal Indicator for the National Climate Assessment

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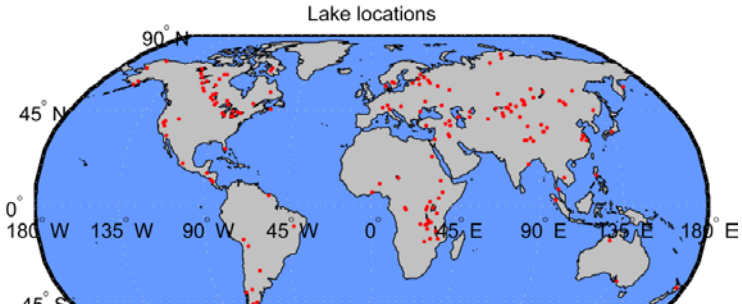
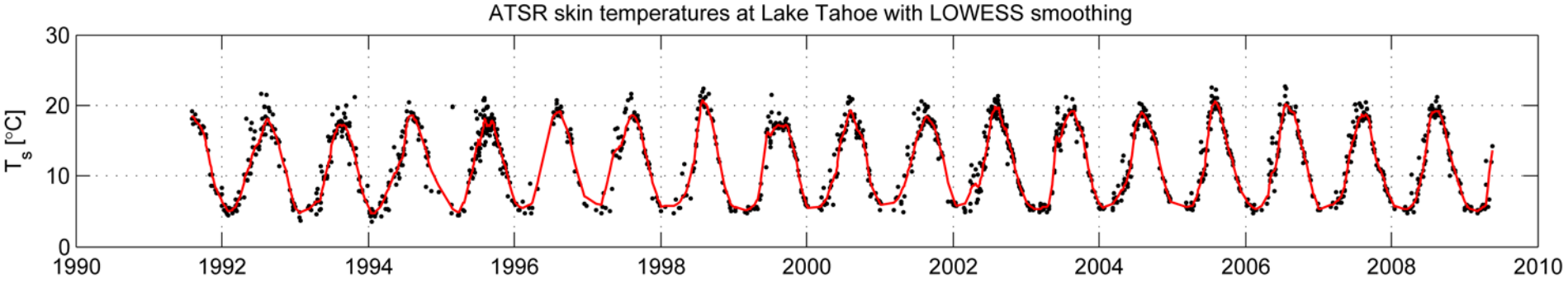
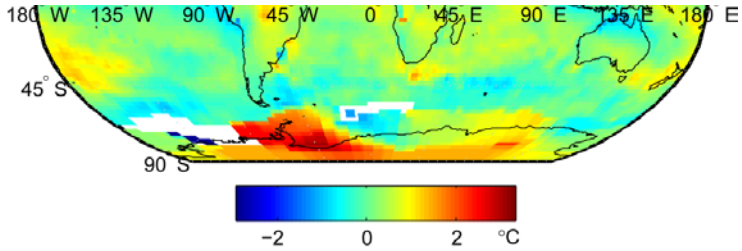
Mono Lake, California, October 2009

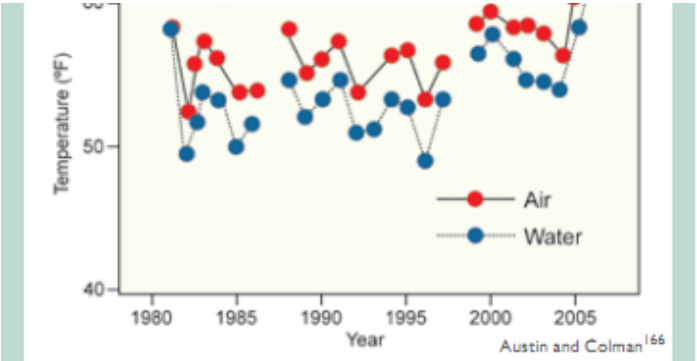
Concept

- The Idea
  - Temperatures of lakes and reservoirs are good indicators of climate trends
  - Existing in situ data is insufficient in space and time









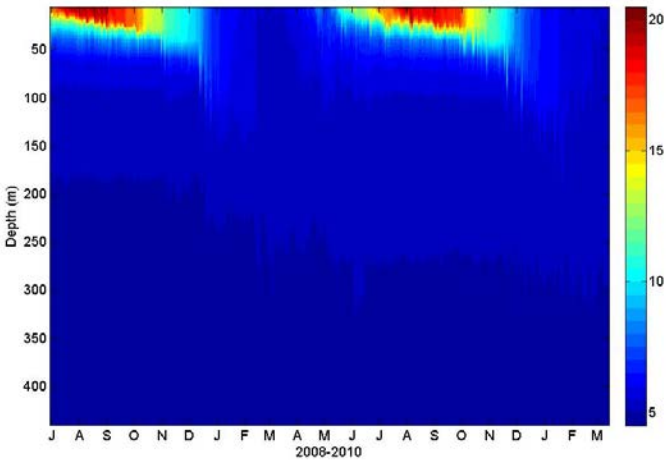
The recent large jump in summer water temperature is related to the recent large reduction in ice cover (see *Midwest* region).

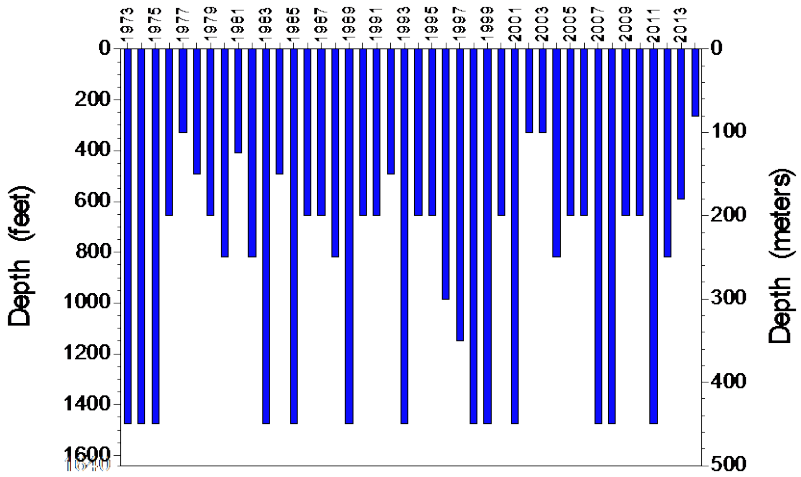
Early work by Austin and Colman for Lake Superior

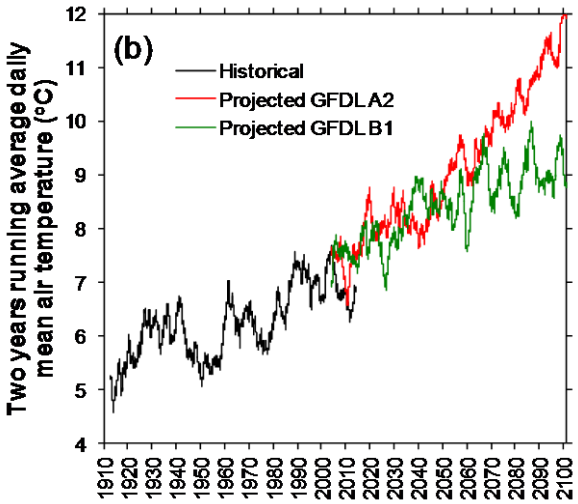
North American Lakes Trends - Top Ten

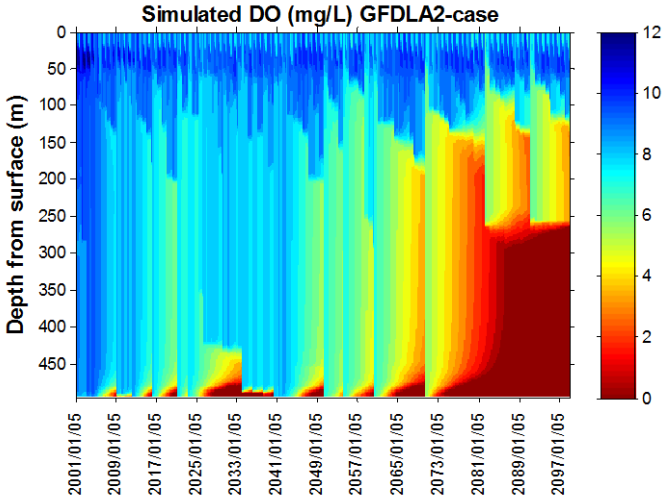
2000 - 2008						
Name	**Slope**	**Intercept**	**R^2**	**p value**	**standard error**	
Smallwood Lake	0.4055	281.65	0.9463	0.0537	0.0980	
Lake Athabasca	0.2971	283.48	0.3819	0.3506	0.2935	
Great Slave Lake	0.1681	283.44	0.2939	0.4799	0.2233	
Lake Winnipeg	0.1519	288.95	0.3123	0.6877	0.3267	
Lake Nicaragua	0.1466	296.82	0.4982	0.2089	0.1042	
Mono Lake	0.1299	292.03	0.7474	0.0206	0.0436	
Martre	0.1253	285.28	0.2480	0.5918	0.2189	
Lake Tahoe	0.1245	290.24	0.6872	0.0526	0.0504	
Walker Lake	0.0992	294.76	0.7608	0.0173	0.0320	
Lake Superior	0.0882	286.06	0.1077	0.6975	0.2882	
2000-2014						
Name	**Slope**	**Intercept**	**R^2**	**p value**	**standard error**	
Lake Athabasca	0.1826	283.88	0.4391	0.1163	0.1079	^
Martre	0.1741	285.08	0.5779	0.0386	0.0741	^
Great Bear Lake	0.1349	275.93	0.5250	0.0973	0.0729	^
Great Slave Lake	0.1338	283.54	0.4002	0.1562	0.0885	v
Lake Claire	0.1050	288.06	0.5019	0.0566	0.0502	^
Dauphin Lake	0.0767	290.42	0.4796	0.0826	0.0405	^
Dore Lake	0.0663	289.02	0.4278	0.1117	0.0389	^
Lake Winnipegosis	0.0550	290.34	0.2482	0.3724	0.0595	^
Lake Mendota	0.0513	294.77	0.2949	0.4082	0.0587	^
Lake Nicaragua	0.0457	297.16	0.3202	0.2862	0.0408	v

Impact of Warming on Stratification









Courtesy G. Schladow – UC Davis

Summary and Conclusions

- Satellite thermal data provides a rich record of changes in surface temperature since 1980.
- After 2000 have excellent validation and data access. Need to improve access to earlier data and validate them
- Currently extending time series first created in 2009 to present day (AVHRR, ATSRx, MODIS). Could add other datasets e.g. VIIRS.
- Incorporating higher resolution AVHRR data over North America available from direct broadcast to increase number of lakes.
- Relating changes in the thermal behavior of the water bodies to changes in surface air temperature data.
- Exploring ecologically relevant indicators that are meaningful to the general public and summarize the data and make it available for the National Climate Assessment writing teams.
- Working with other to look at future predictions of lake temperatures and the consequences