

Confronting Climate Change in the Great Lakes Region

Technical Appendix Climate Change Projections

COMPARISON OF CLIMATE PROJECTIONS

Projections of future climate change presented in this report are those given by the latest versions of the [HadCM3 and Parallel Climate Models](#), driven by the [scenarios](#) recently released in the IPCC Special Report on Emission Scenarios (SRES; IPCC, 2000). Results from the HadCM3 and PCM models are generally in good agreement with each other and other state-of-the-art models running the SRES scenarios. However, there are some significant differences between HadCM3 and PCM results for the SRES A2 ('upper mid-range') and B2 ('lower mid-range') scenarios and previous studies that used older versions of these models and the outdated IS92 emissions scenarios. The most important differences between SRES-based results and previous ones include:

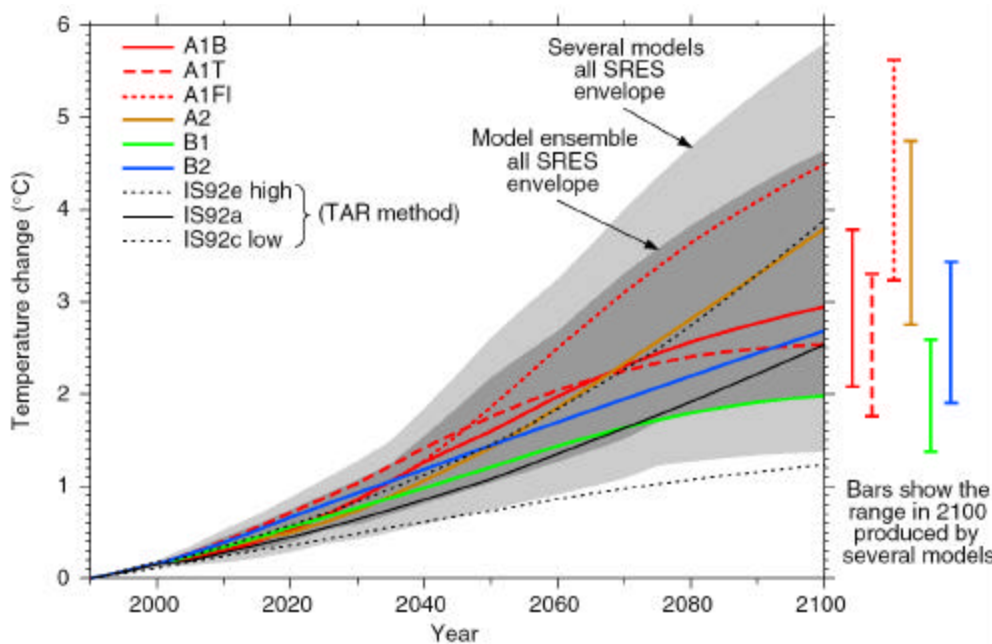
- a stronger summer warming
- a smaller winter warming
- little change or a small decrease in summer precipitation over most areas
- a smaller but significant increase in winter precipitation

These new findings need to be taken into account when assessing potential climate change impacts, as shifts in seasonal characteristics, annual cycles and geographical gradients of temperature and precipitation can strongly affect projected affects of future change on the Great Lakes region.

Table 1. Comparison of HadCM3 and PCM results for the SRES 'mid-range' (A2 and B2) scenarios with HadCM2 and CGCM1 model projections for the IS92a business-as-usual scenario for the Great Lakes region. Projections are shown for daily average temperature anomaly and percentage change in precipitation relative to 1961-1990 average.

	2030				2090			
	PCM	HadCM3	USGRCP		PCM	HadCM3	USGRCP	
			HadCM2	CGCM			HadCM2	CGCM
Temp (DJF)	insig. change	insig. change	n/a	n/a	4-5 °C	2-4 °C	4.0 °C	6-7 °C
Temp (JJA)	1.0-2.0°C	1.5-3 °C	n/a	n/a	2-3°C	5-7 °C	2.0 °C	4.0 °C
Precip (DJF)	0 to +20%	+10% to +20%	± 5%		0 to +20%	+5% to +35%	-20% to +70%	
Precip (JJA)	0	0	+15-25%		0	-15% to +10%	+10% to +40%	

Figure 1. Temperature projections corresponding to emissions for the SRES scenarios and the earlier IS92a scenario. (Source: IPCC, 2000)



We believe the results presented here represent improvements over those used in previous assessments for several reasons. First, these projections come from the very latest generation of climate modeling technology, whereas previous assessments were based on older models. Secondly, climate change projections are calculated based on the recently released SRES emission scenarios. These new scenarios contain more realistic projections of aerosols and other climate-altering substances, eliminating spurious cooling effects seen in previous model results. Finally, the new emission scenarios span a far wider range of greenhouse gas emissions and projected temperature change than the IS92 scenarios (Figure 1). Analyses of future climate change on the IS92 scenarios therefore tend to underestimate the magnitude of potential change.

In contrast to the projections for the thirty-year period 2070-2099 given in this report, the previous U.S. National Assessment examined two decades, 2024-2035 and 2090-2099. To enable direct comparison between these results and those given in the National Assessment, Figures 2 and 3 show HadCM3 projections for this same time period, based on the SRES mid-range scenarios.

Figure 2. HadCM3 winter and summer temperature anomalies relative to 1961-1990 average. Temperature anomalies are given for two periods: 2030 (2024-2035) and 2095 (2090-2099), and for two SRES scenarios: the A2 ('higher mid-range') and B2 ('lower-mid-range') scenario.

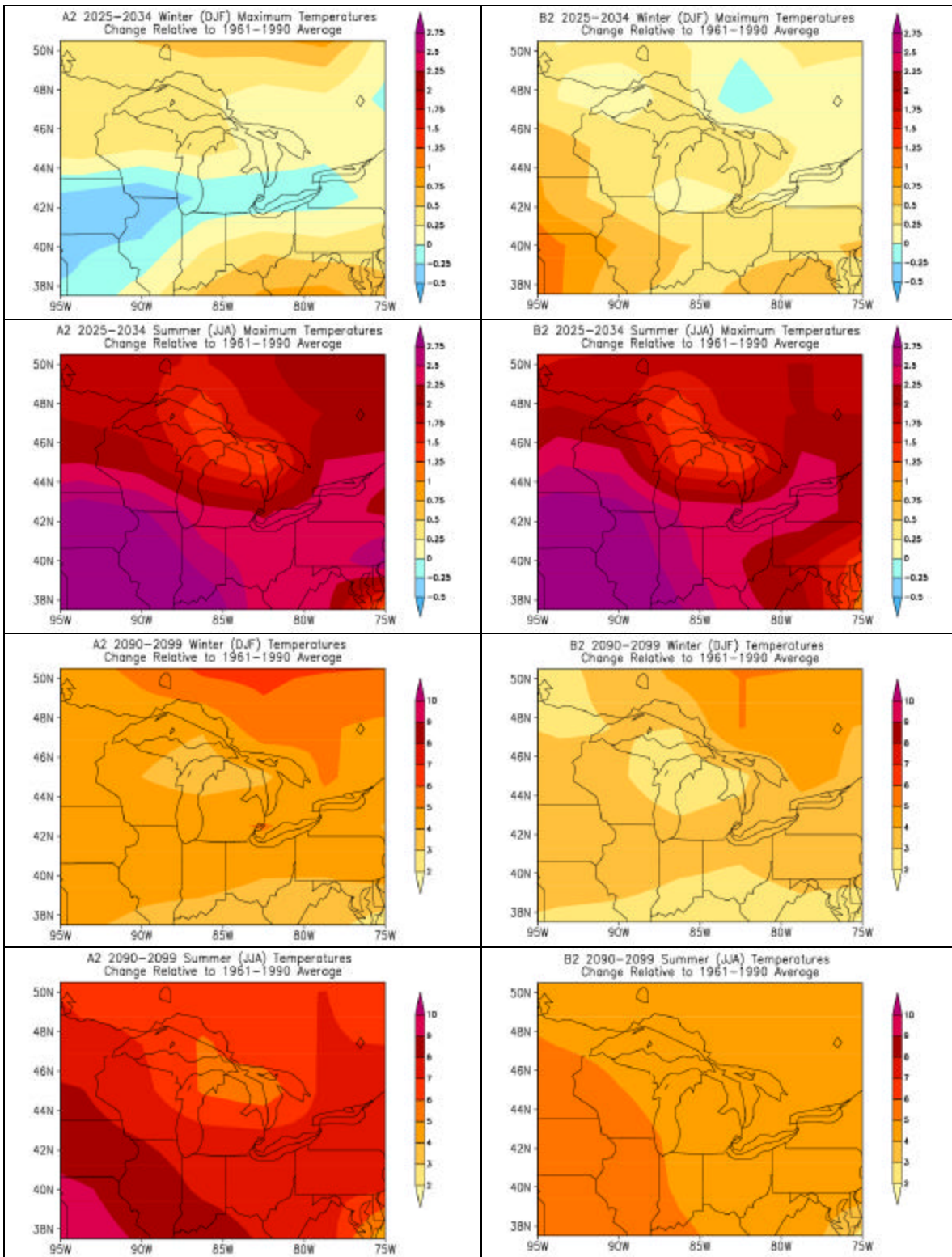
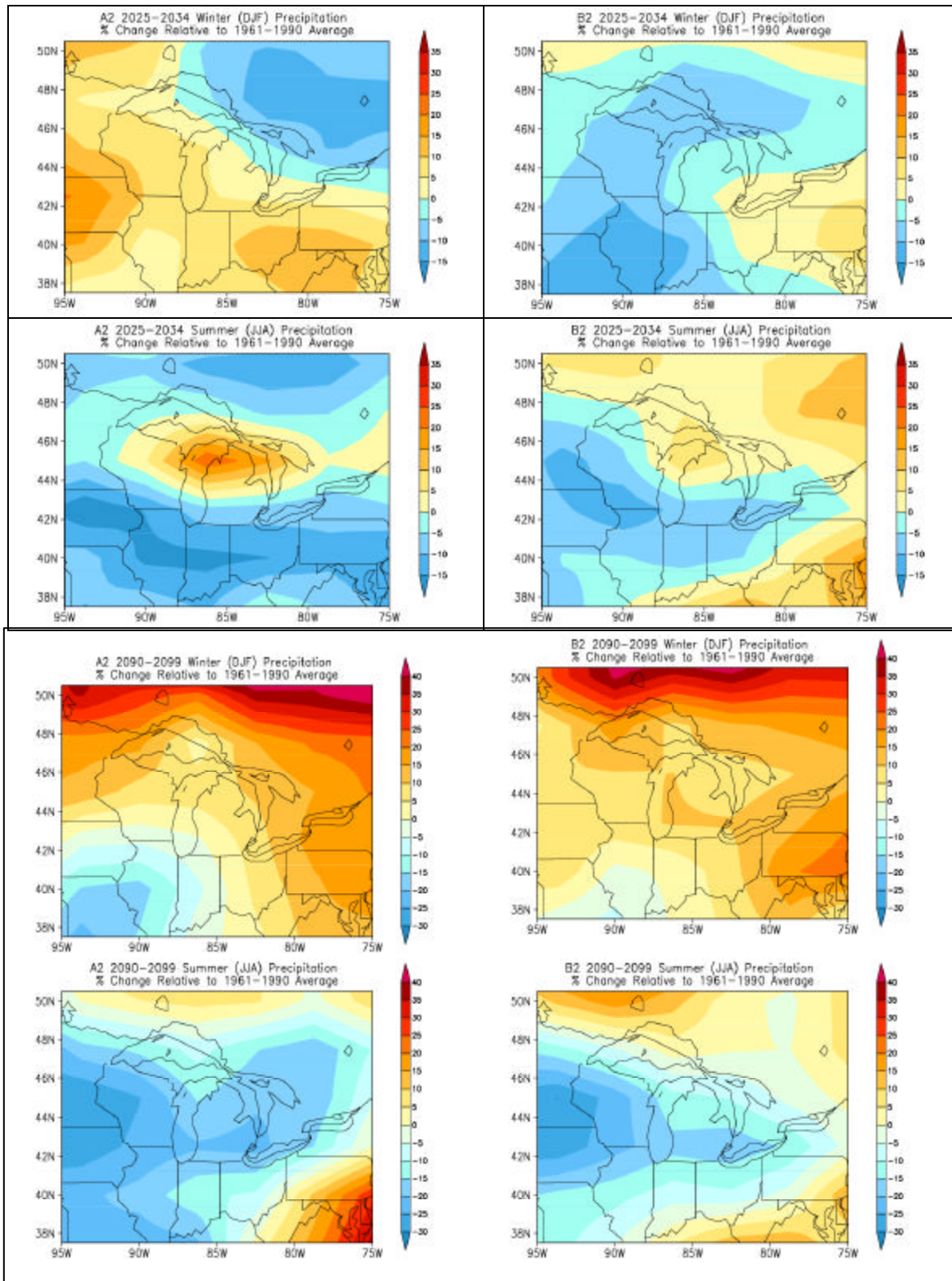


Figure 3. HadCM3 winter and summer precipitation anomalies relative to 1961-1990 average. Percentage change in precipitation is given for two periods: 2030 (2024-2035) and 2095 (2090-2099), and for two SRES scenarios: A2 ('higher mid-range') and B2 ('lower-mid-range') scenario.



References

Intergovernmental Panel on Climate Change: 1992, 1992 IPCC Supplement, J.T. Houghton, B.A. Callander and S.K. Varney (eds.), Cambridge, Cambridge University Press.

Intergovernmental Panel on Climate Change: 2000, Special Report on Emissions Scenarios, N. Nakicenovic (ed.), Cambridge, Cambridge University Press.

U.S. Global Change Research Program. 2000. U.S. National Assessment of the Potential Consequences of Climate Variability and Change: A detailed overview of the consequences of climate change and mechanisms for adaptation. <http://www.usgcrp.gov/usgcrp/nacc/> (accessed 2002).