Exposure of Rural Communities to Climate Variability and Change: Case Studies from Argentina, Colombia and Canada

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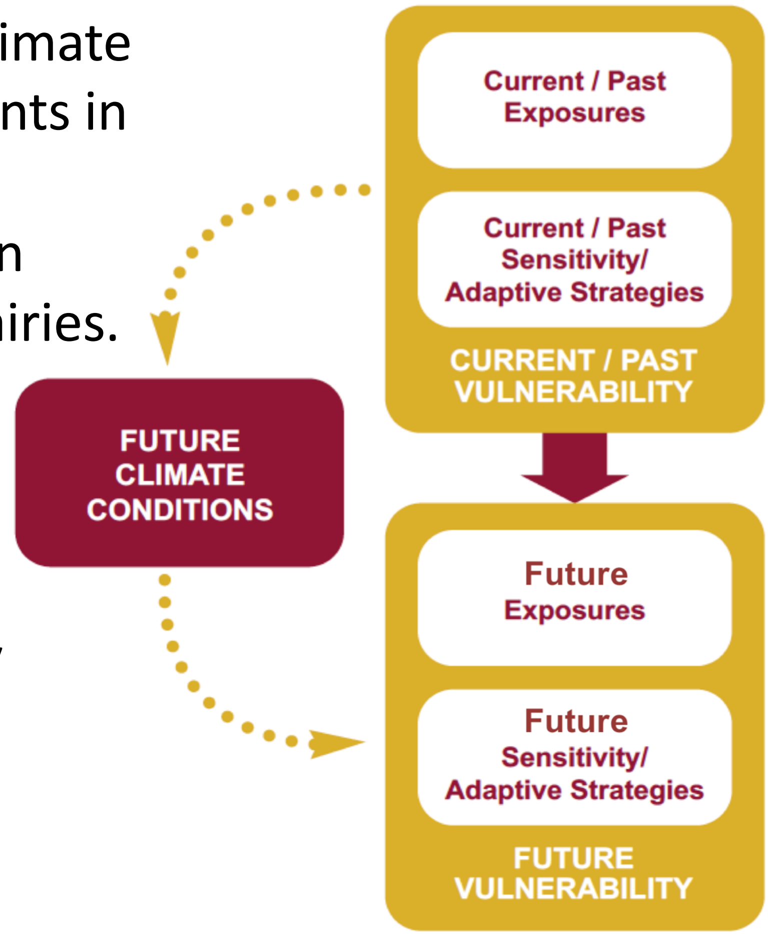
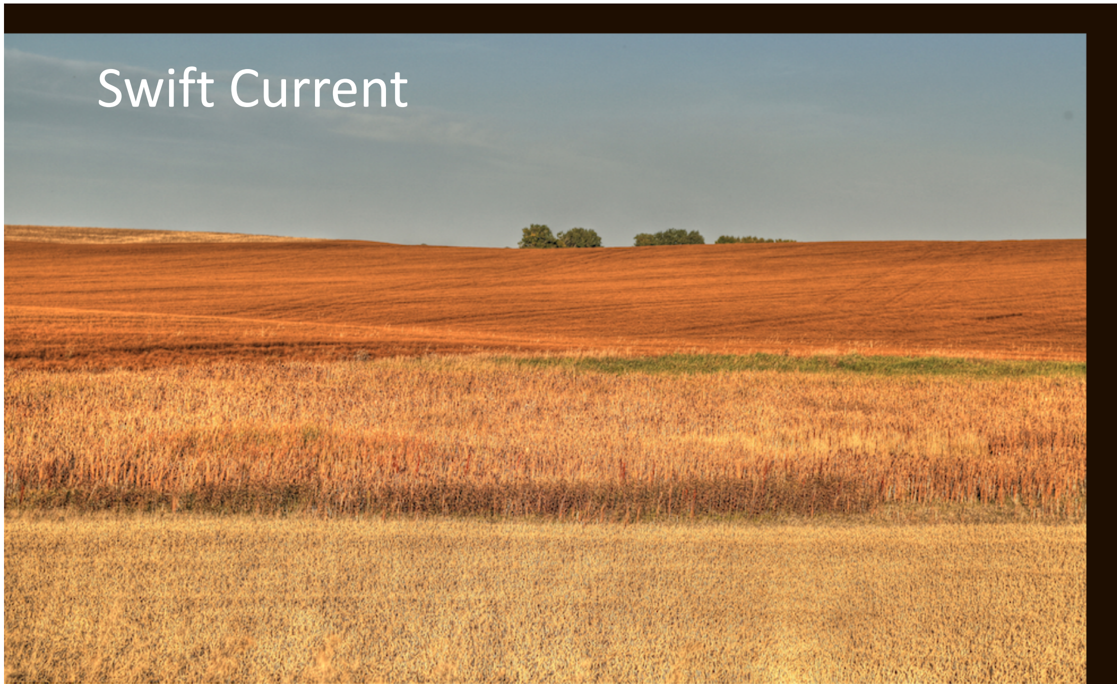
Studies of exposure to climate change and extreme events in River Basins in western Argentina, the Colombian Andes, and Canadian Prairies.



These case studies of exposure are very much informed by community vulnerability assessments carried out during the initial stages of the VACEA project.

River Basin	Country	Region or Province	Size (km^2)	Agricultural production
Chinchiná	**Colombia**	Caldas	1,052	coffee, fruits, maize, cattle
Mendoza	**Argentina**	Mendoza	17,821	grapes, fruits, cattle, horticulture, goats
Oldman	**Canada**	Alberta	26,700	grains, pulses, forage, vegetables, cattle
Swift Current		Saskatchewan	5,592	grains, pulses, forage, cattle


Swift Current


Chinchiná


Mendoza


Oldman

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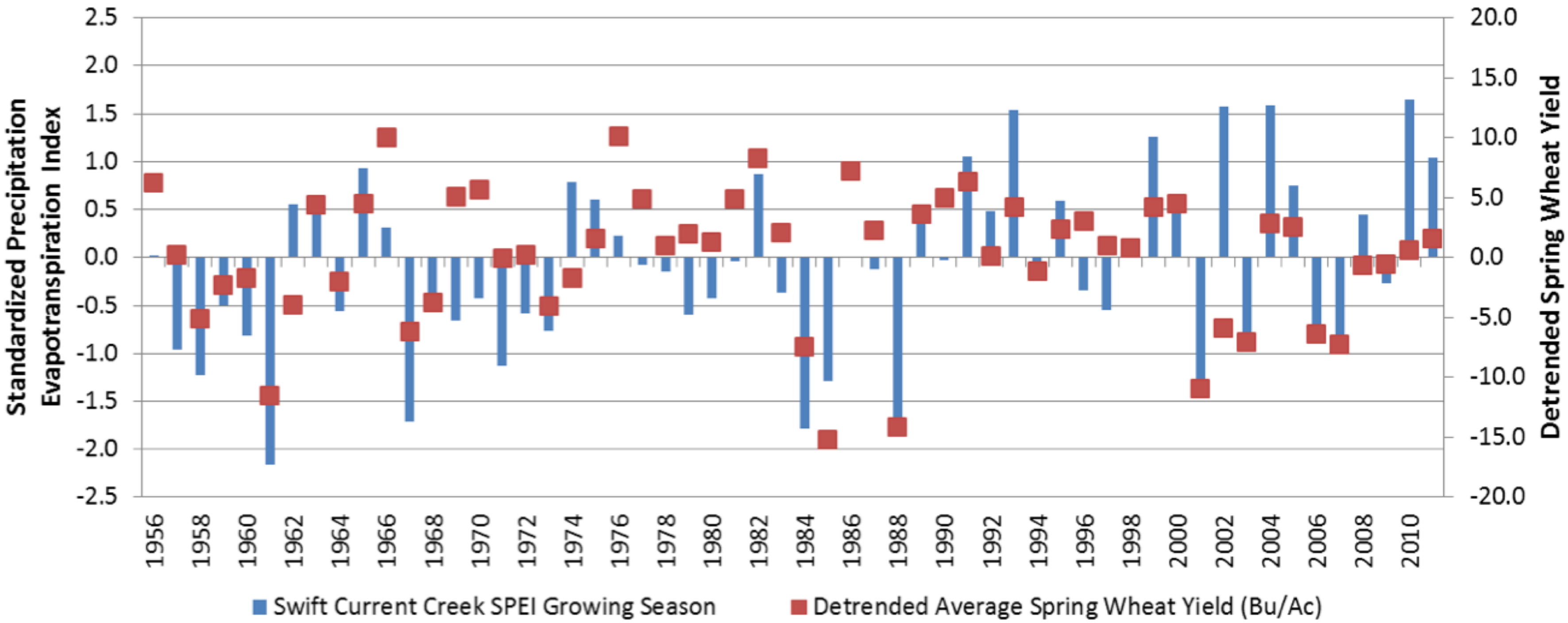

Growing season (May to August) Standardized Evapotranspiration Precipitation Index (SPEI) and spring wheat yields for the Swift Current Creek watershed over the period 1956-2012.

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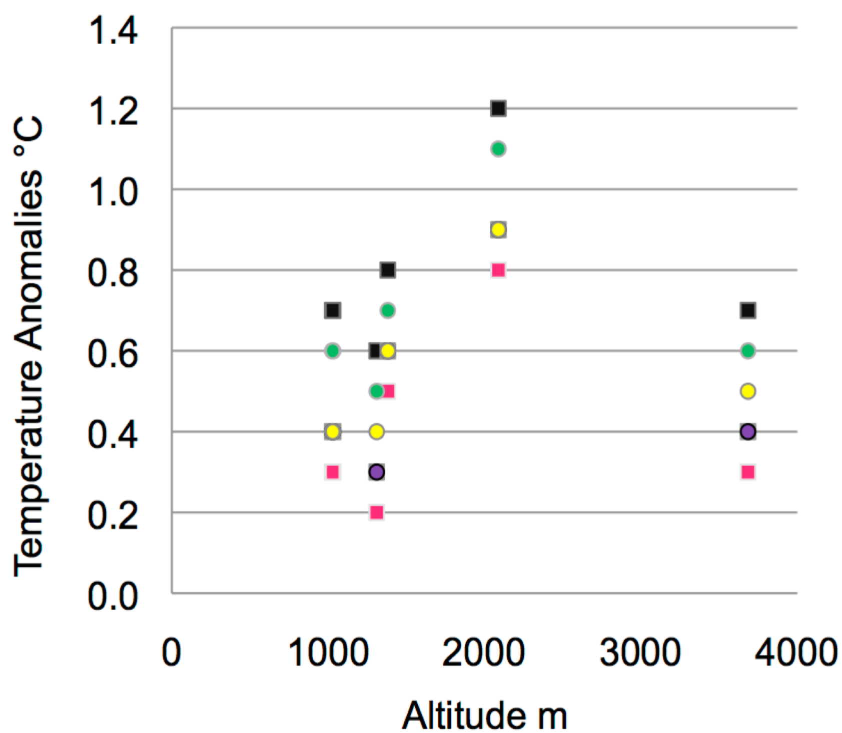

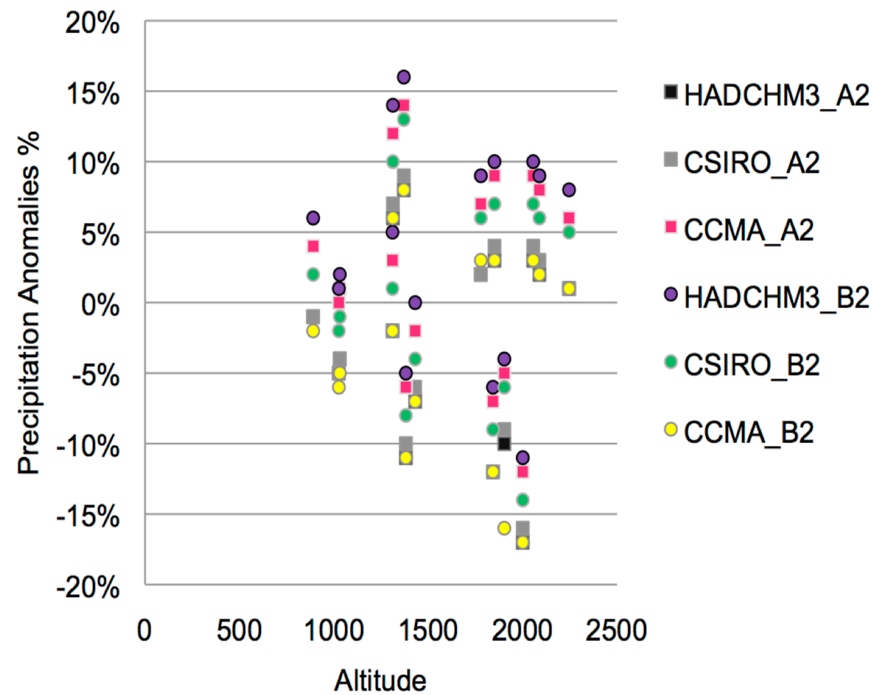

Climate change scenarios for the Chinchiná River basin: Precipitation (%) and temperature (º C) anomalies, 2010-2039 versus 1981-2010

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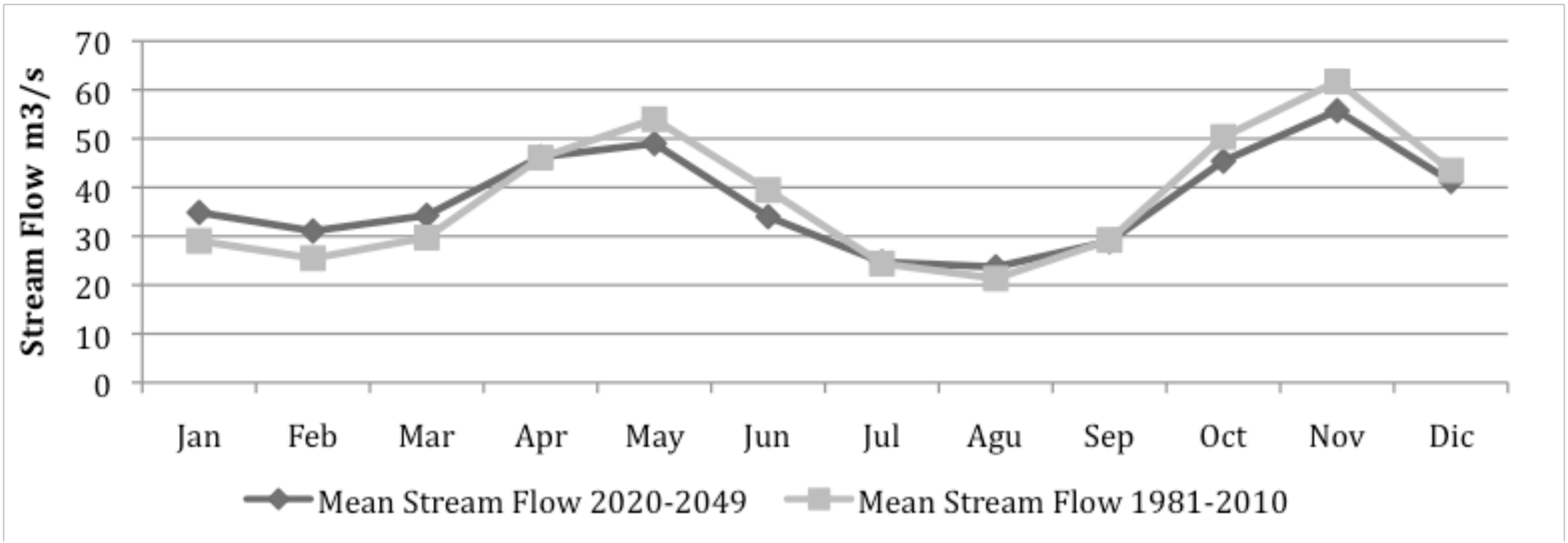
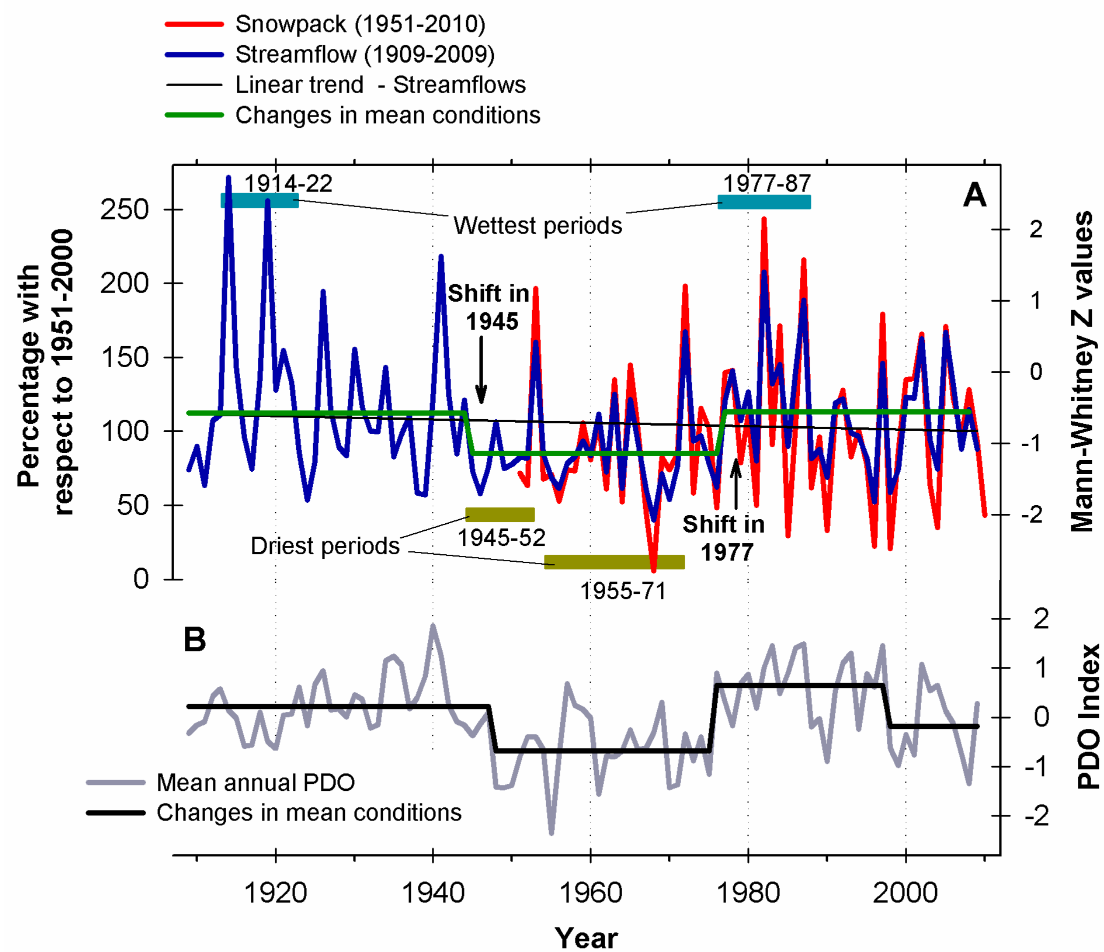


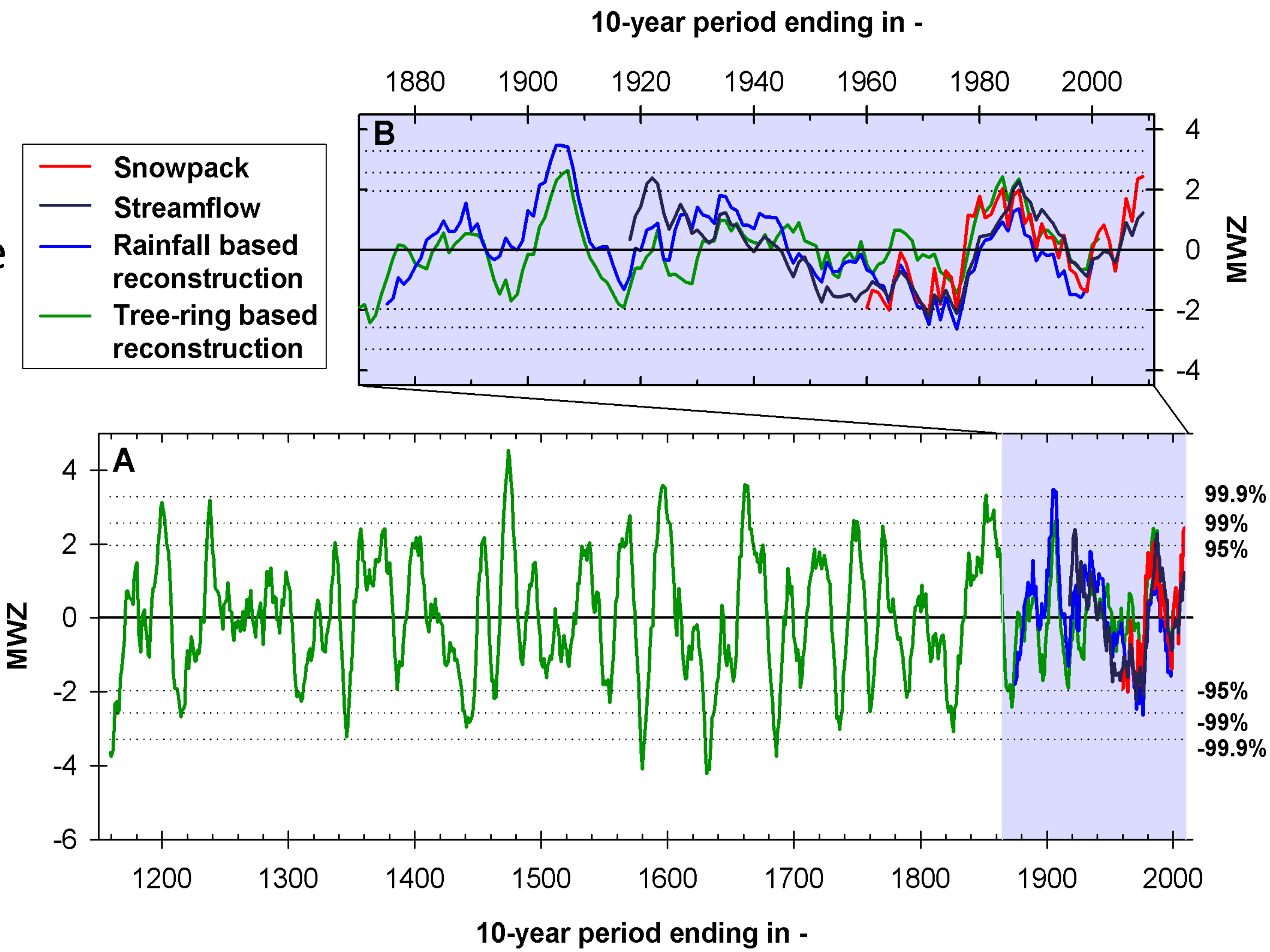
The impact of the projected climate changes on the Chinchiná River. There is little change in **mean monthly flows**. On average streamflow is reduced by about 1%.

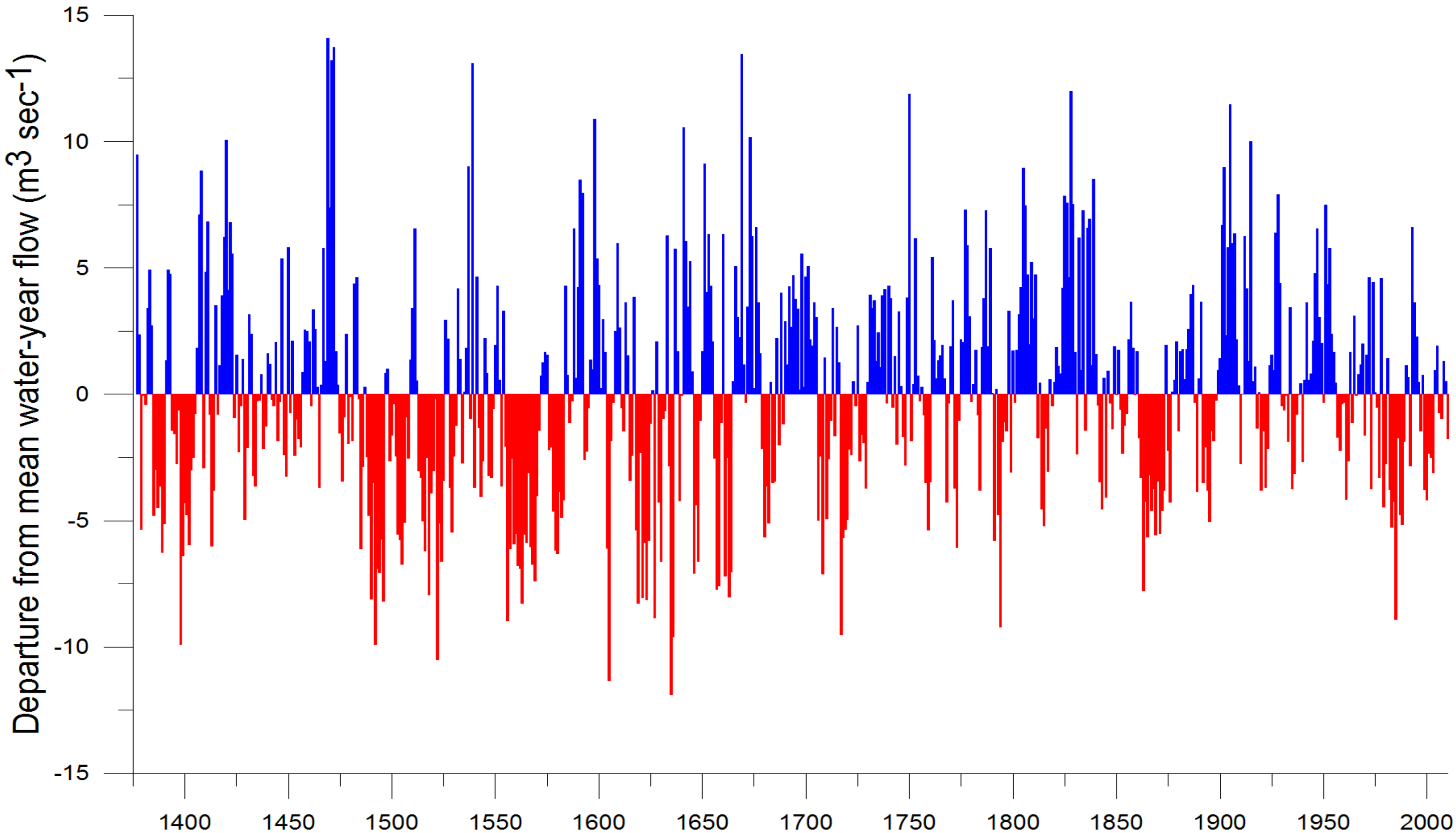
A: Regional snowpack (red) and streamflow (blue) records from west-central Argentina and adjacent Chilean Andes. Statistically **significant shifts in mean flow conditions** (green line) occurred in 1945 and 1977

B: a 1909–2009 time series of the mean July to June PDO index (gray) and shifts in mean levels (black)



Reconstructed (A) and measured (B) snowpack and streamflow, southern Andes. All time series display **coherent patterns of decadal variation**. Horizontal dotted lines indicate extreme wet dry conditions





Annual flow of the Oldman River, 1377-2010, reconstructed from tree rings and plotted as positive (blue) and negative (red) anomalies.

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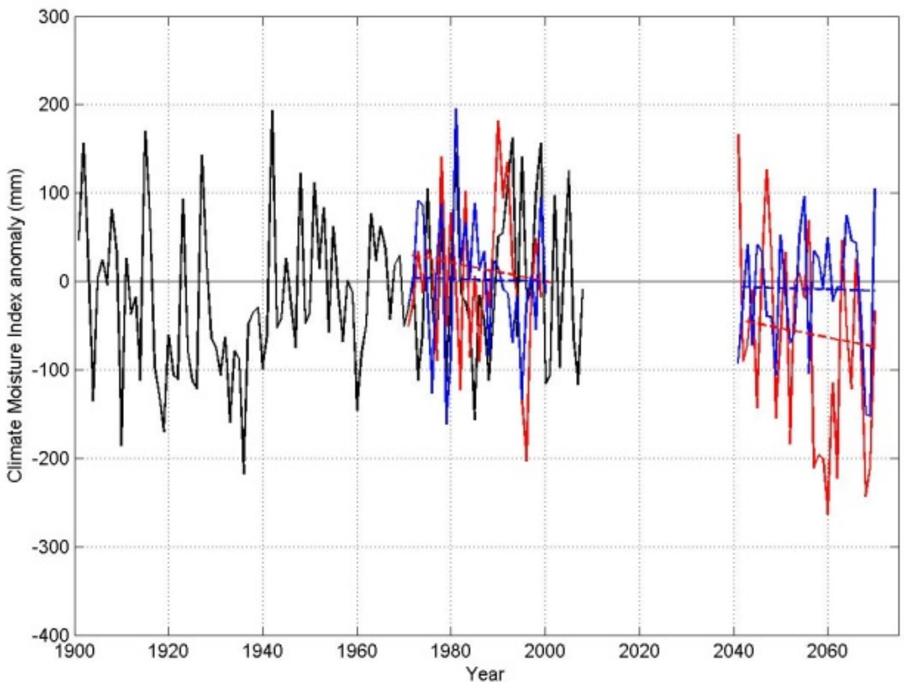
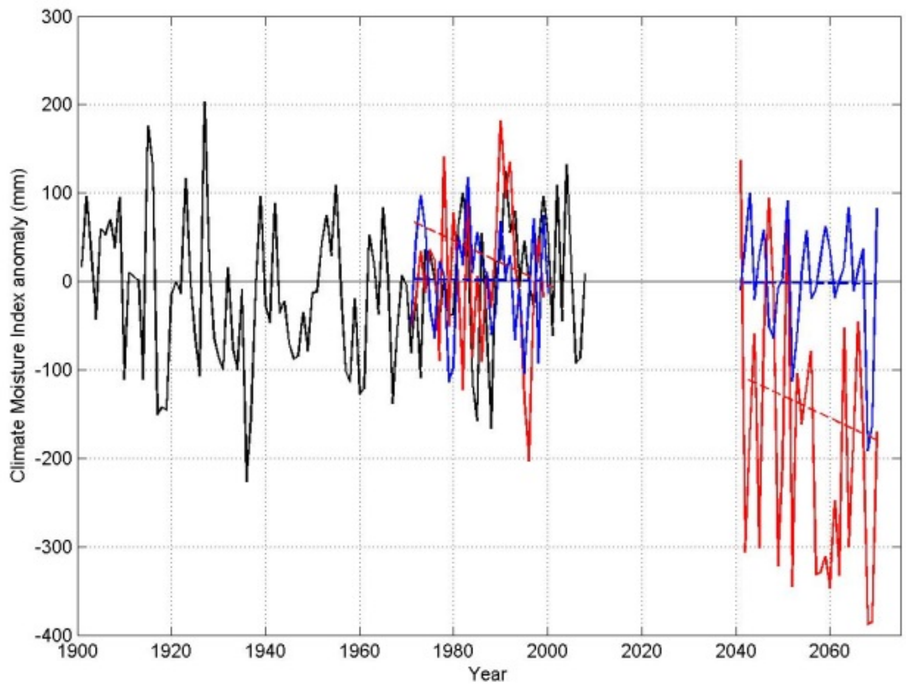
May-June-July Climate Moisture Index Anomaly (mm) (relative to 1971-2000)

Historical CRCM-CCSM WRFG-CGCM3

Oldman River



Swift Current Creek



Conclusions

1. Climate changes and variability are similar among the river basins despite the distances between them. This similarity reflects global nature of climate change and teleconnections between the Pacific Ocean oscillations and regional hydroclimate.
2. Climate variability between years and decades masks the regional expression of global climate change. The observations and perceptions of agricultural producers are consistent with this dominant natural variability. They experience weather not climate.
3. Adaptive capacity is tuned to seasonal and interannual variability. The main threat posed by climate change is from extreme and unexpected weather, which is more often viewed as natural climatic variability rather than an indication of climate change.

Conclusions

4. The perceptions of residents of the agricultural communities was critical information, not only for an evaluation of sensitivity and adaptive capacity, but also for understanding the most locally-relevant aspects of climate variability and change.
5. Our assessment of exposure places the extreme hydroclimate experienced by these communities in a long-term and natural science context. Extreme dry years are not as uncommon as believed by local actors.
6. The important implication of our case studies is that evidence-based adaptation policy and planning requires interdisciplinary work. Research in the natural sciences depends on social science for understanding key variables and relevant scales of analysis, and studies of exposure inform the evaluation of sensitivity and adaptive capacity.

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THANK YOU VERY MUCH FOR YOUR ATTENTION!

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Some Guiding Questions

- **How do we communicate the consequences of global climate changes in regions where the climate change signal is obscured by natural climatic variability?**
- **How useful are climate model projection in these regions given the uncertainty related to natural climate variability?**
- **What are the pitfalls of a remote scientific assessment of exposure, without the local social context?**
- **How can scientific information on exposure to climate variability and change be best applied to local adaptation planning.**

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