
Atmospheric Overview of the June 2013 Flooding Event

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Atmospheric-Related Talks

Ron: Background, observations, other events

Julie: Climatology, synoptics, GEM 2.5 km products, evaluations and interpretations

Yanping: Precipitation, WRF products, evaluations, interpretations

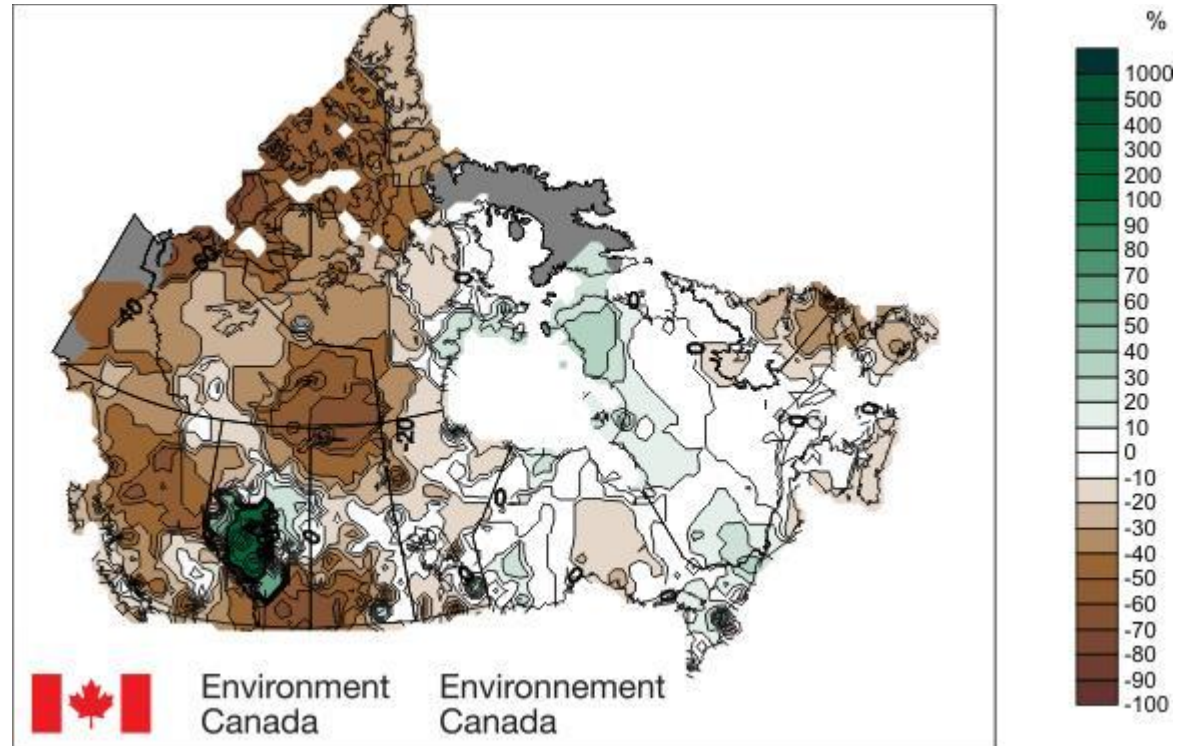
This Presentation

Objective: To provide a brief summary of some of the atmospheric aspects of the event:

- Some background climatology and pre-conditions
 - Large scales, precipitation, precipitation systems
 - Comparison with other events
 - Summary and questions
-

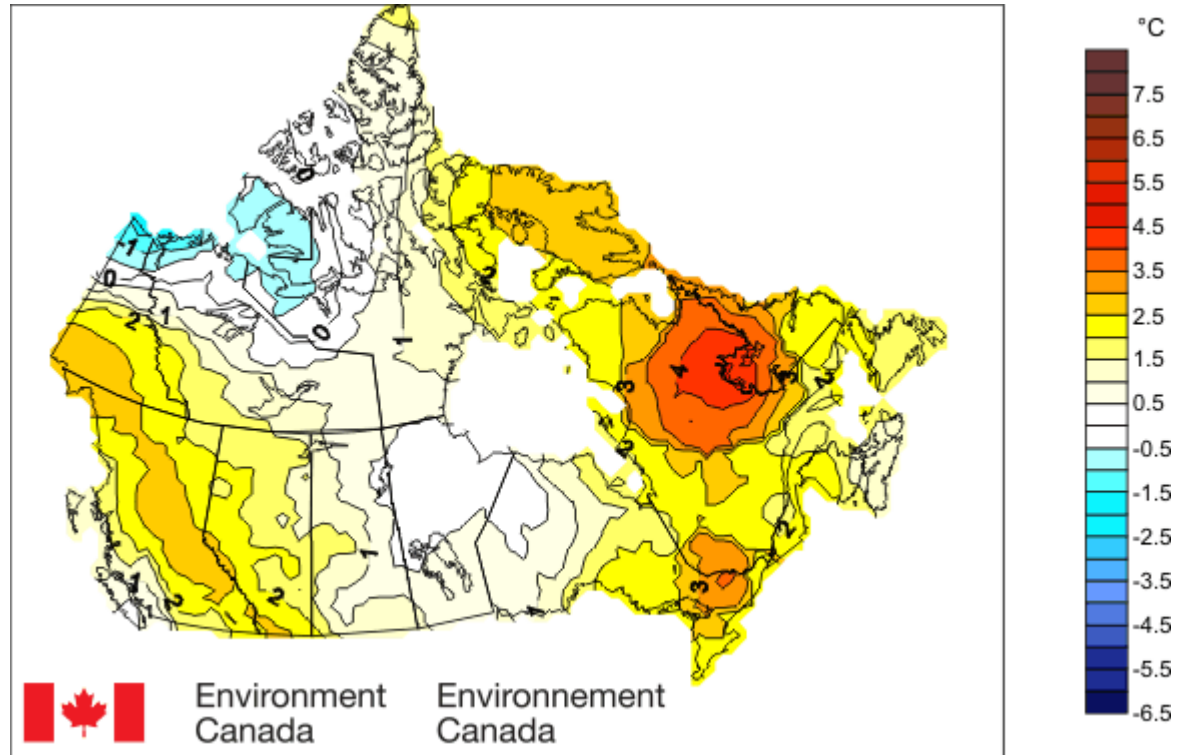
Winter 2012/13 Precipitation Anomaly

D, J, F
relative to 1961-90

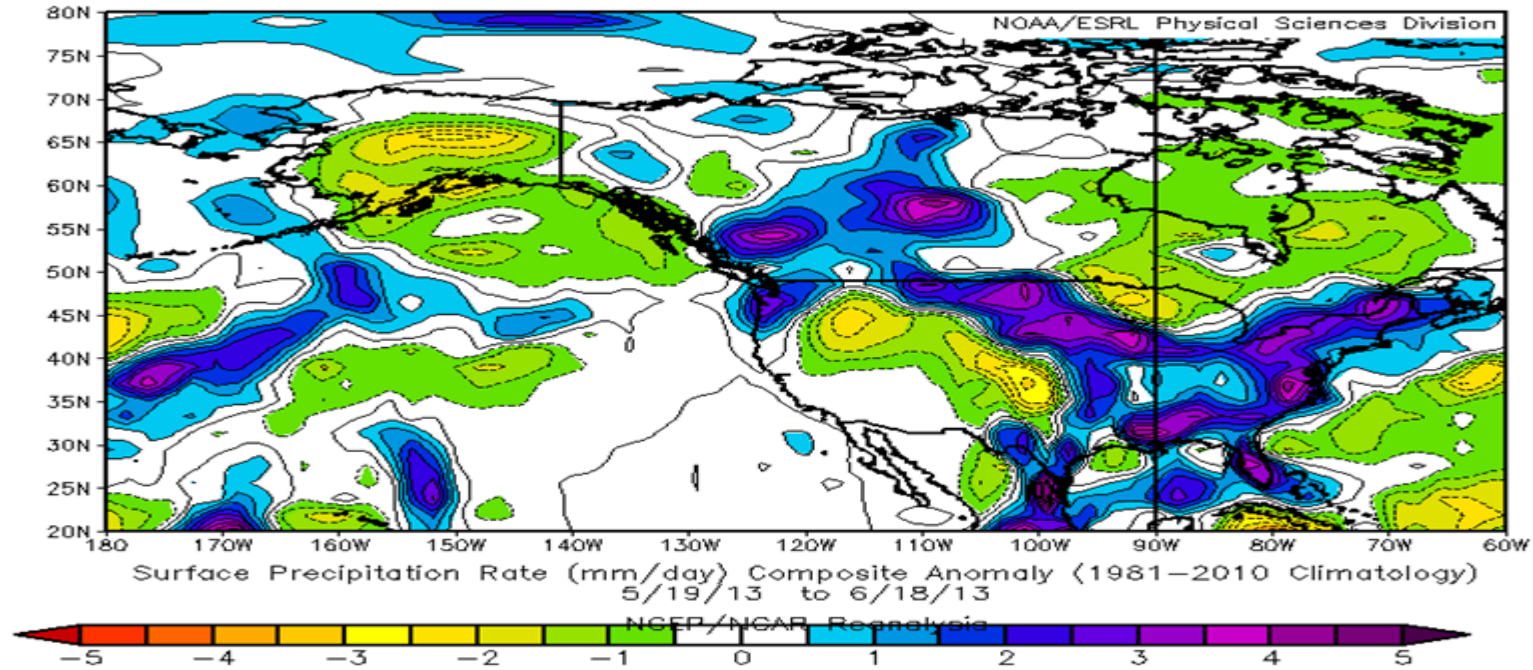


2012/13 Temperature Anomaly

D, J, F
relative to 1961-90

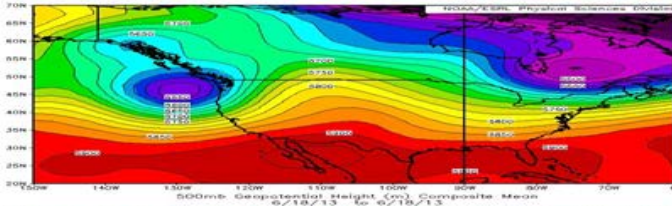


Precipitation May 19 - June 18

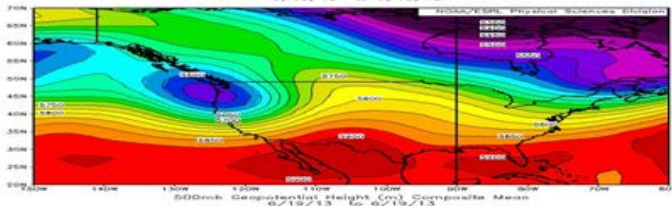


500 mb Heights

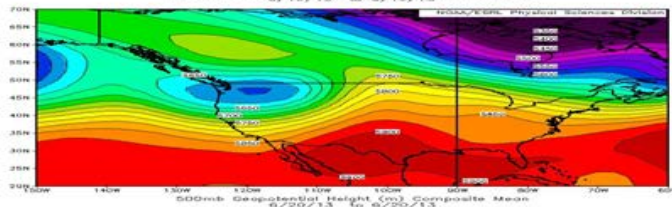
June 18



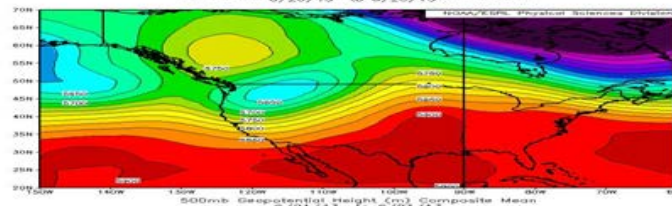
June 19



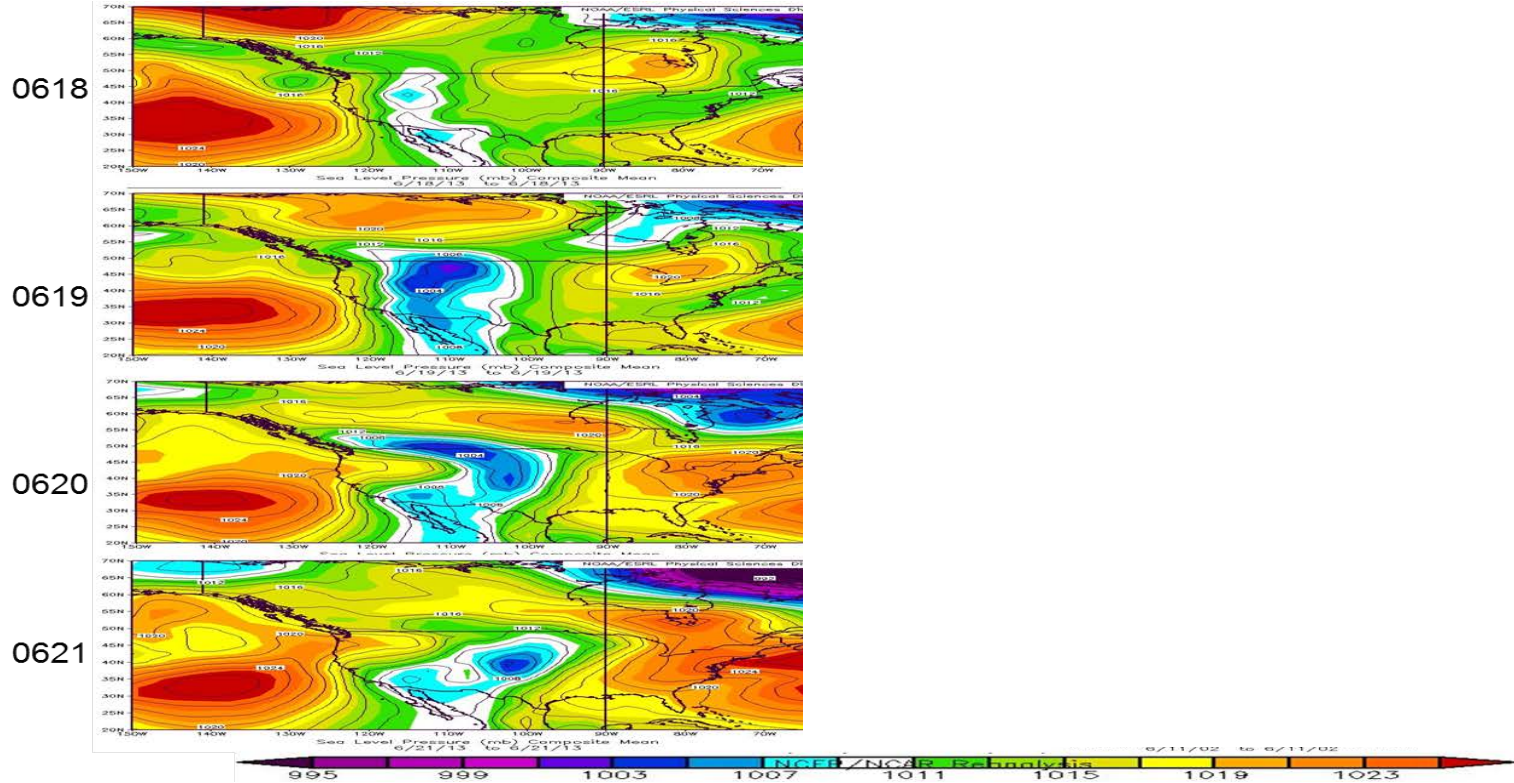
June 20



June 21



Surface Pressure

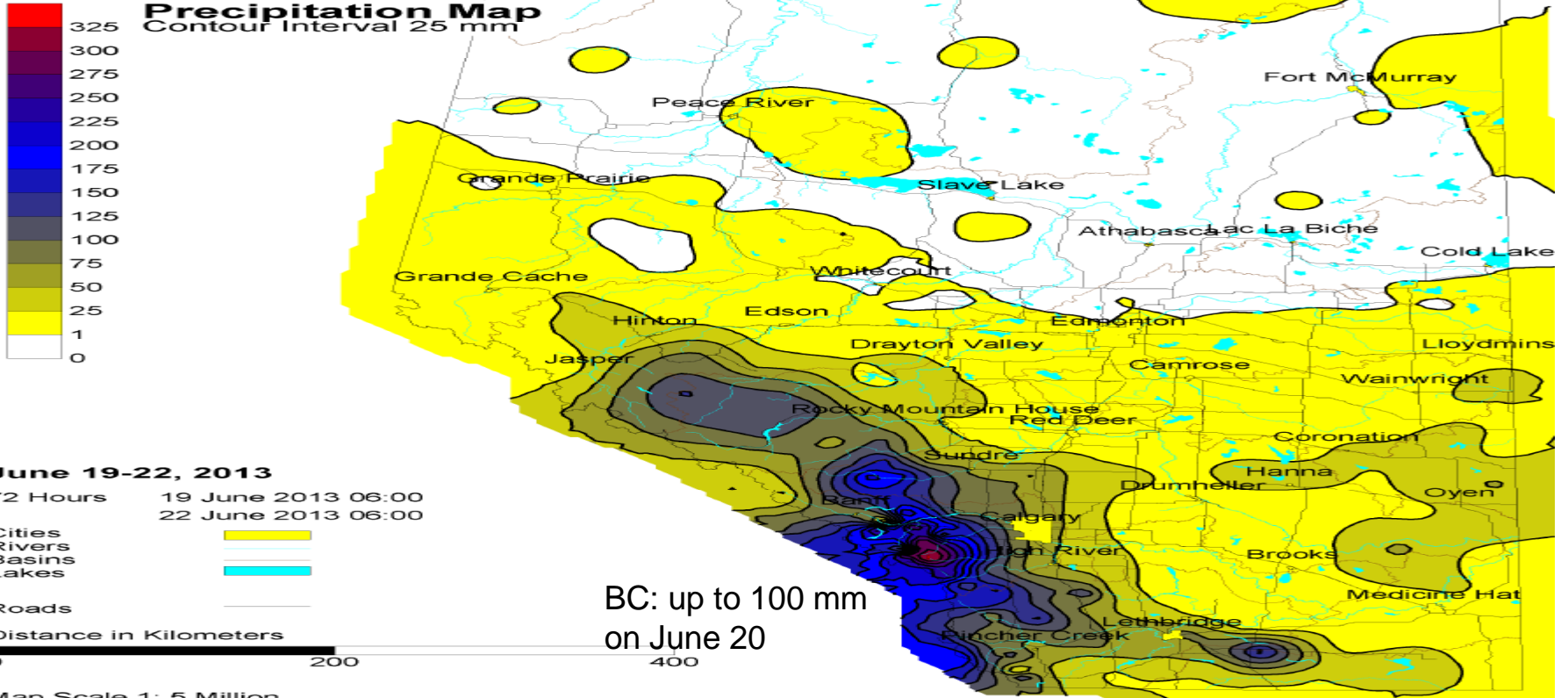


Precipitation Accumulation

Alberta Environment and Sustainable Resource Development

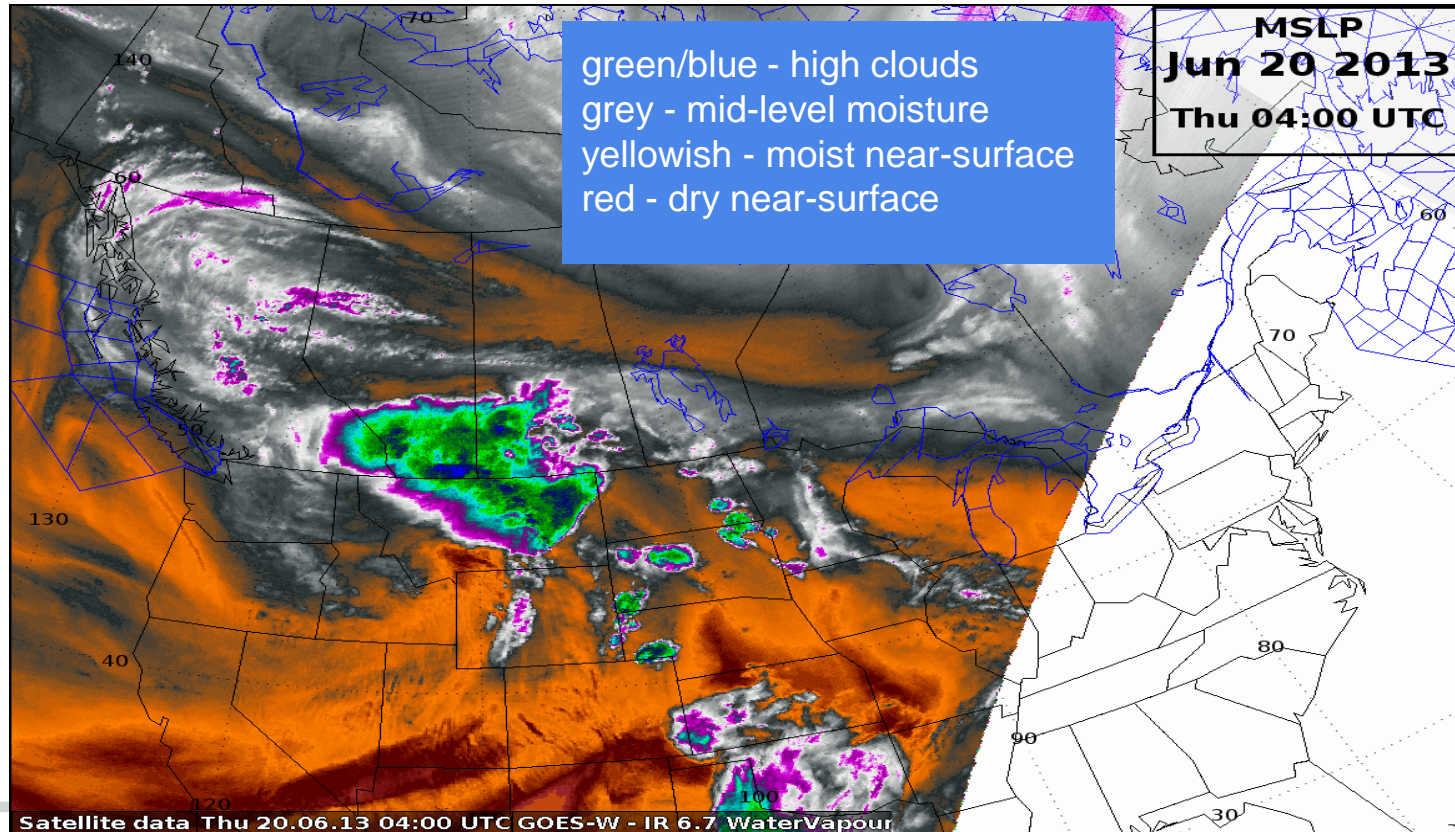
Precipitation Map

Contour Interval 25 mm



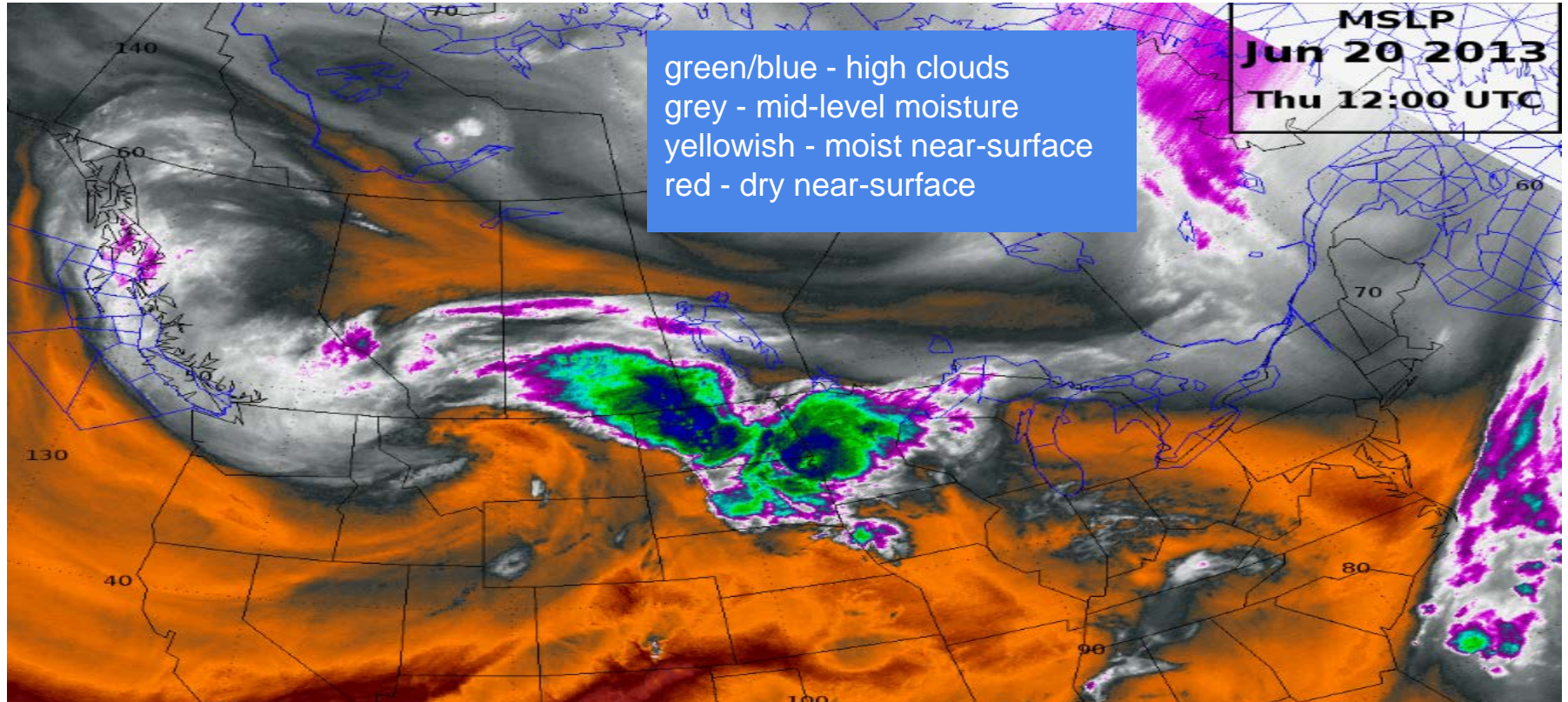
GOES Water Vapour/Clouds

04 UTC June 20, 2013

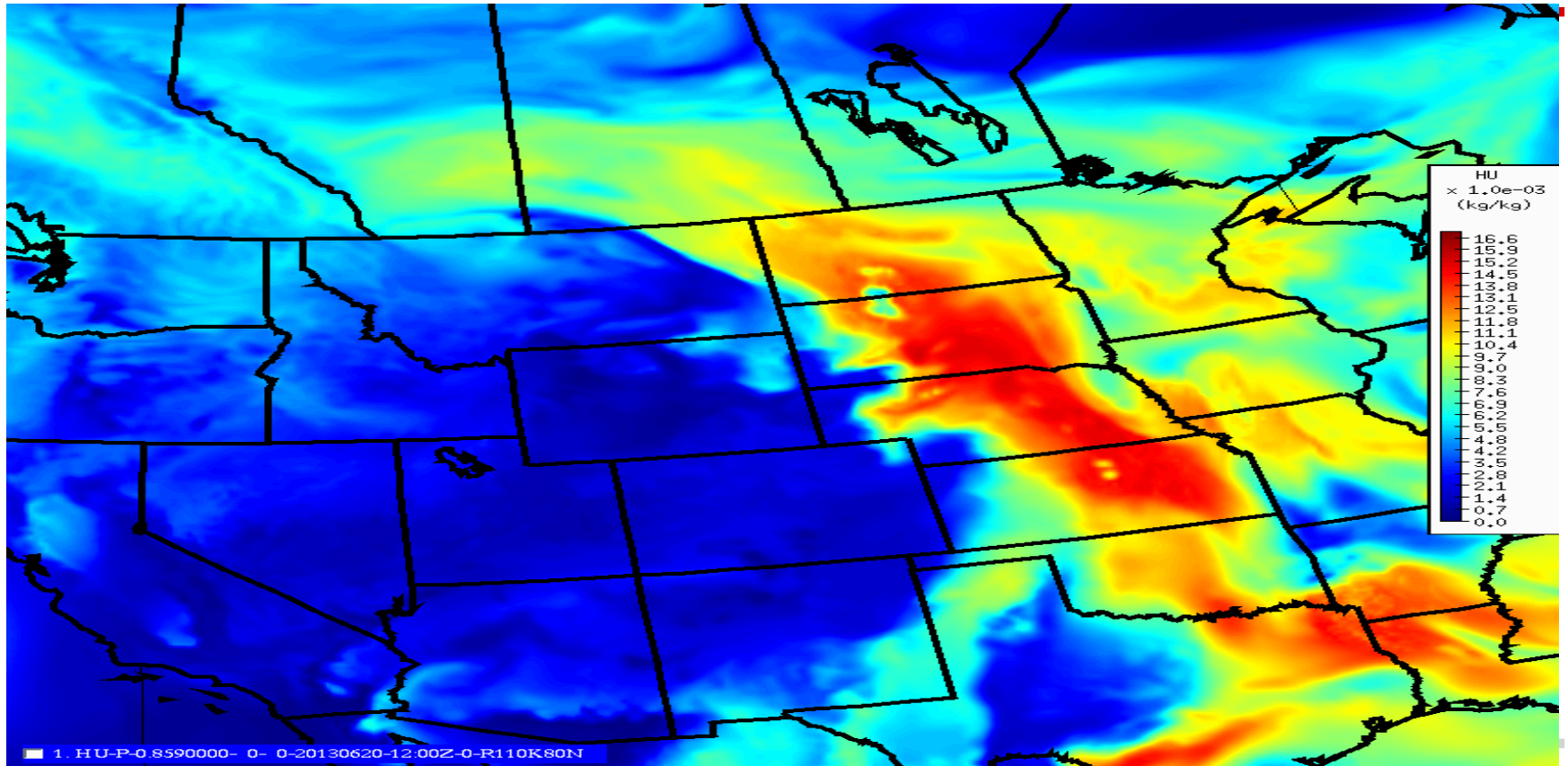


GOES Water Vapour/Clouds

12 UTC June 20, 2013



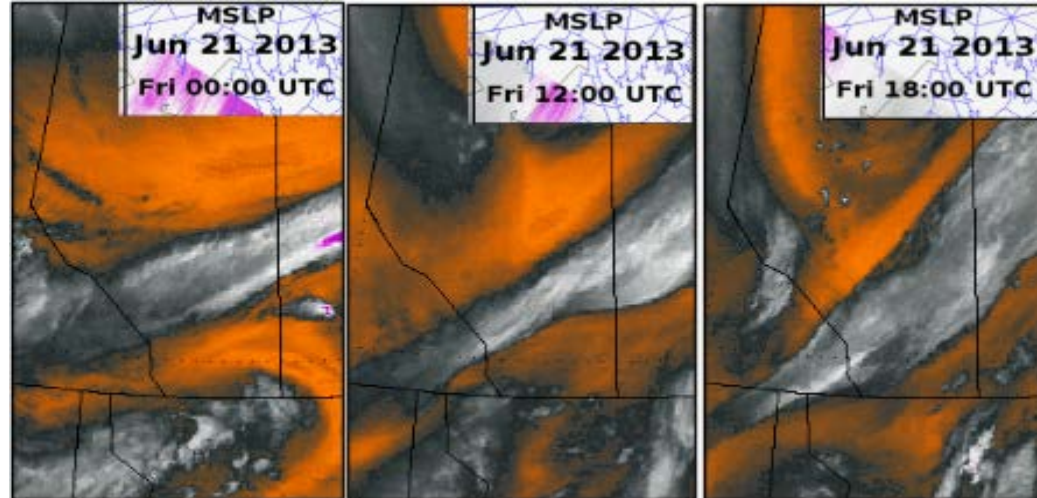
Specific Humidity 12 UTC, June 20 at 1200 m agl



GOES Water Vapour/Clouds

June 21, 2013

green/blue - high clouds
grey - mid-level moisture
yellowish - moist near-surface
red - dry near-surface

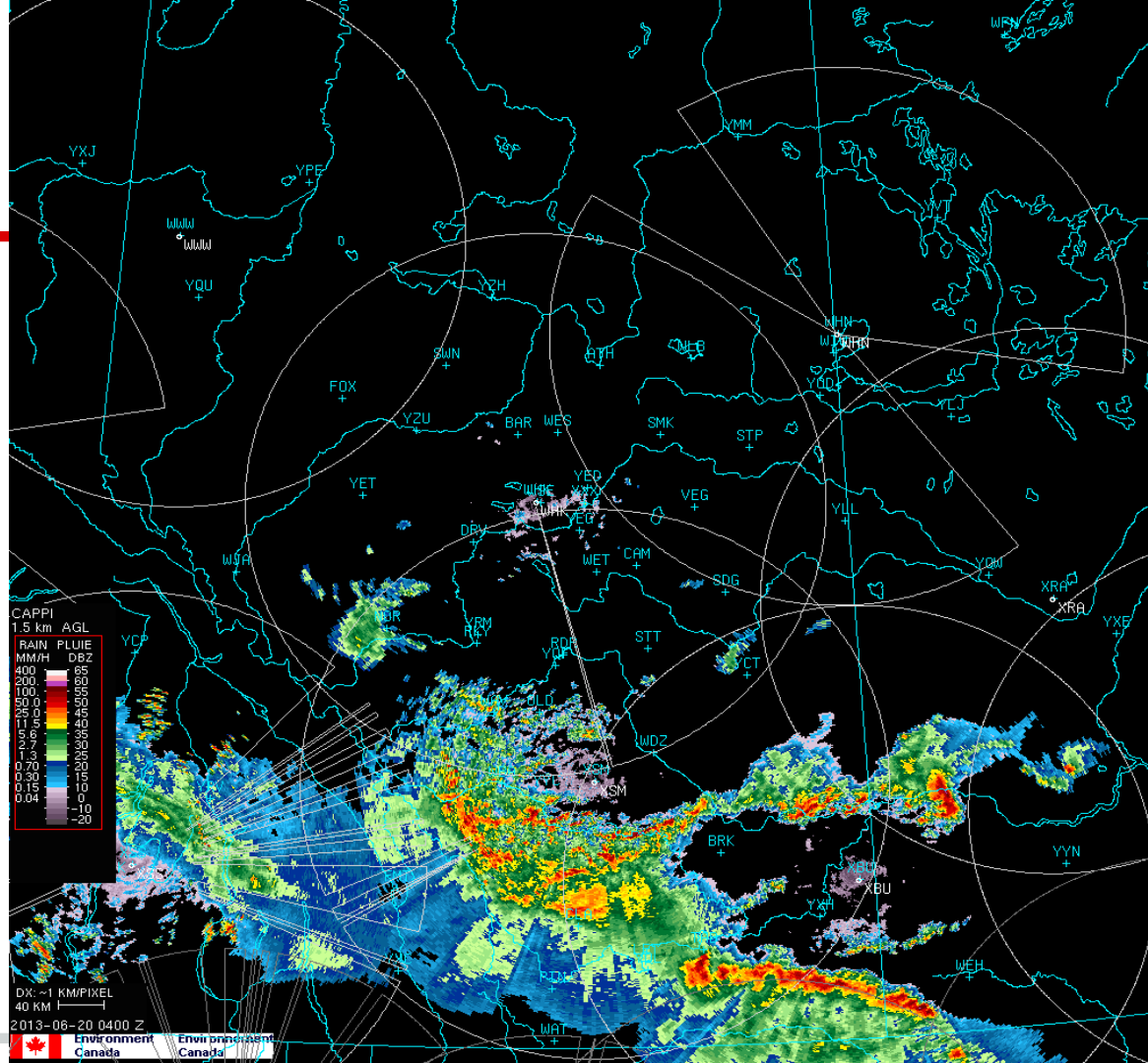


Composite

04 UTC

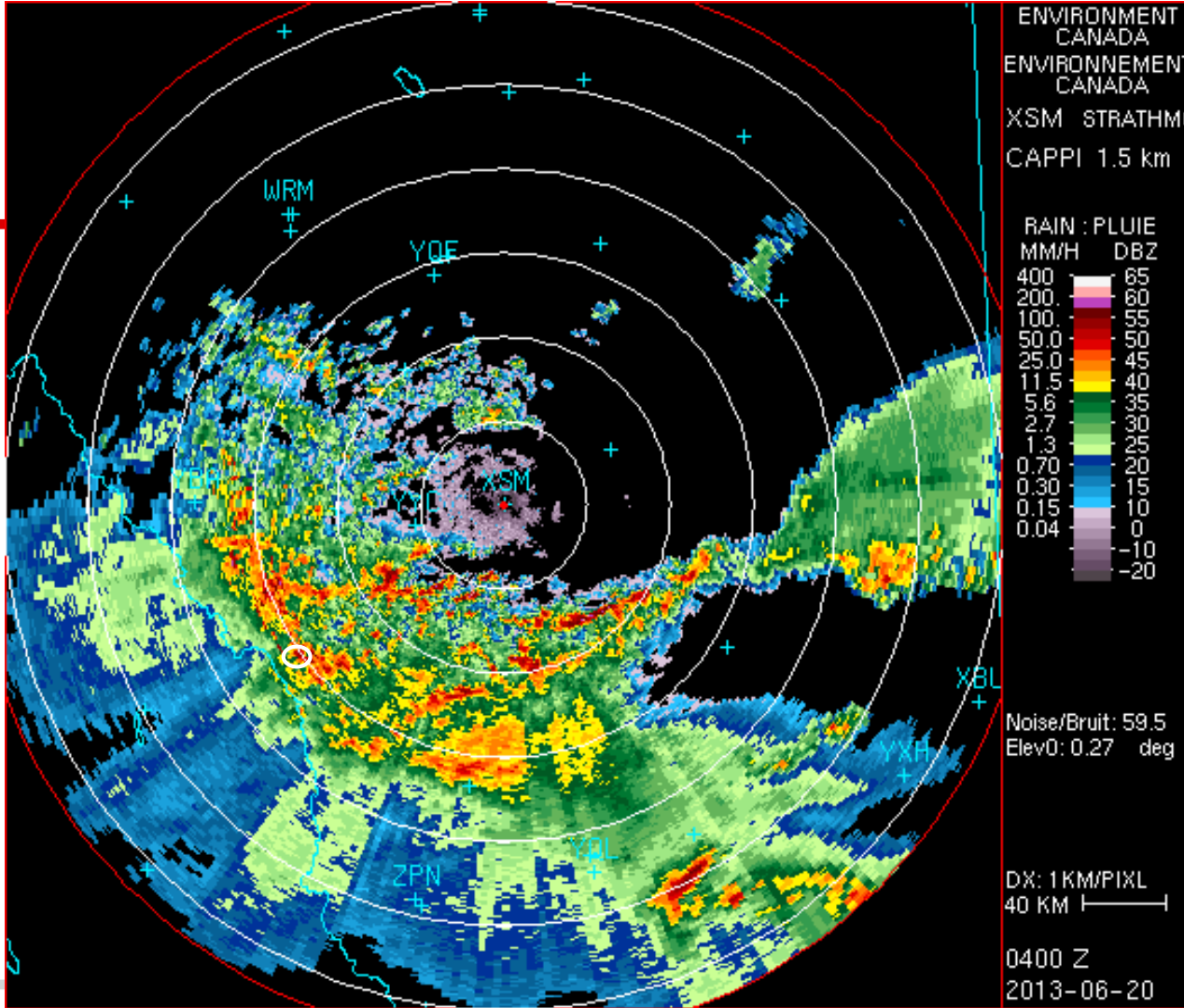
June 20

around time of
highest
precipitation rate
Burns Creek



Strathmore

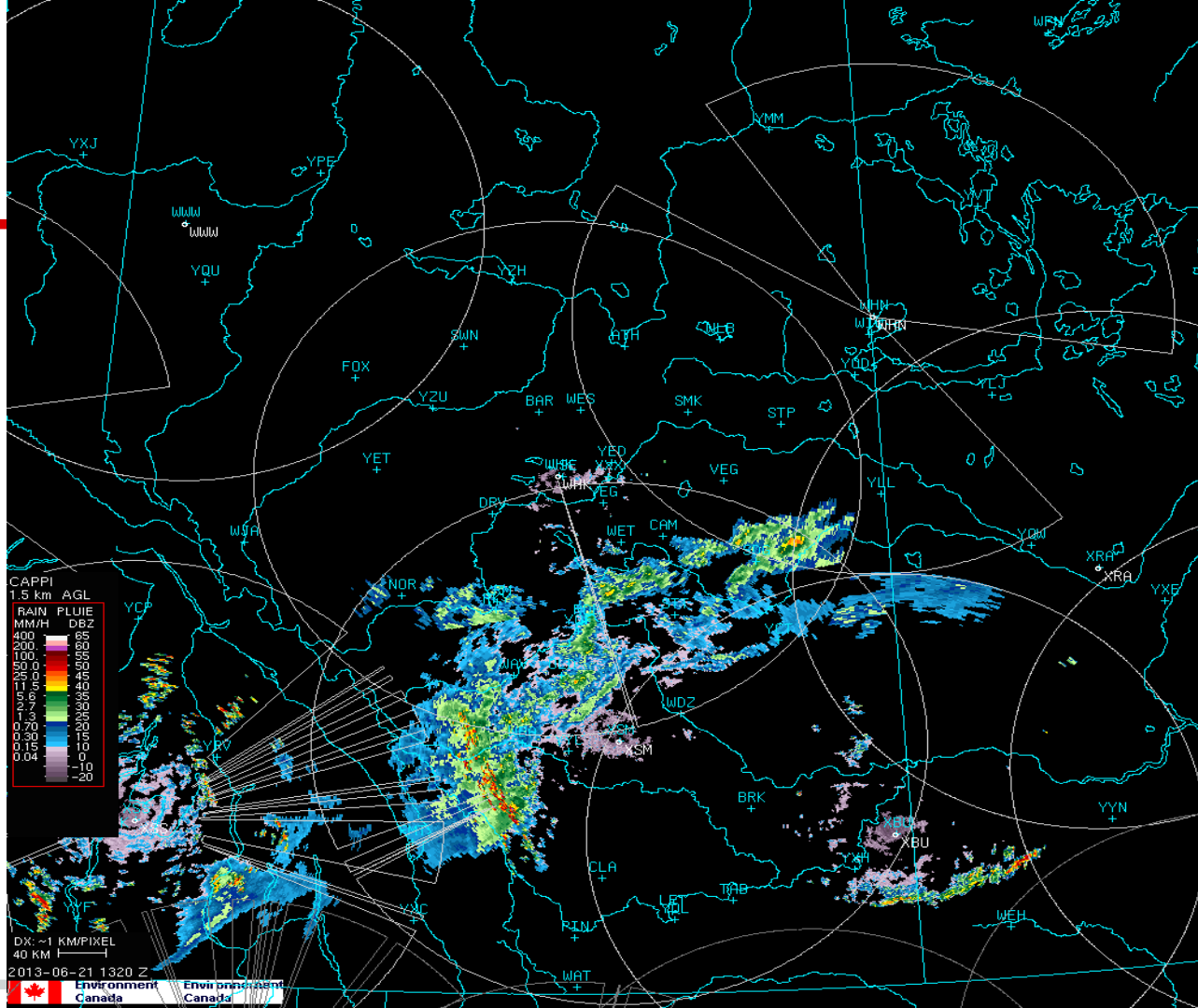
04 UTC
June 20



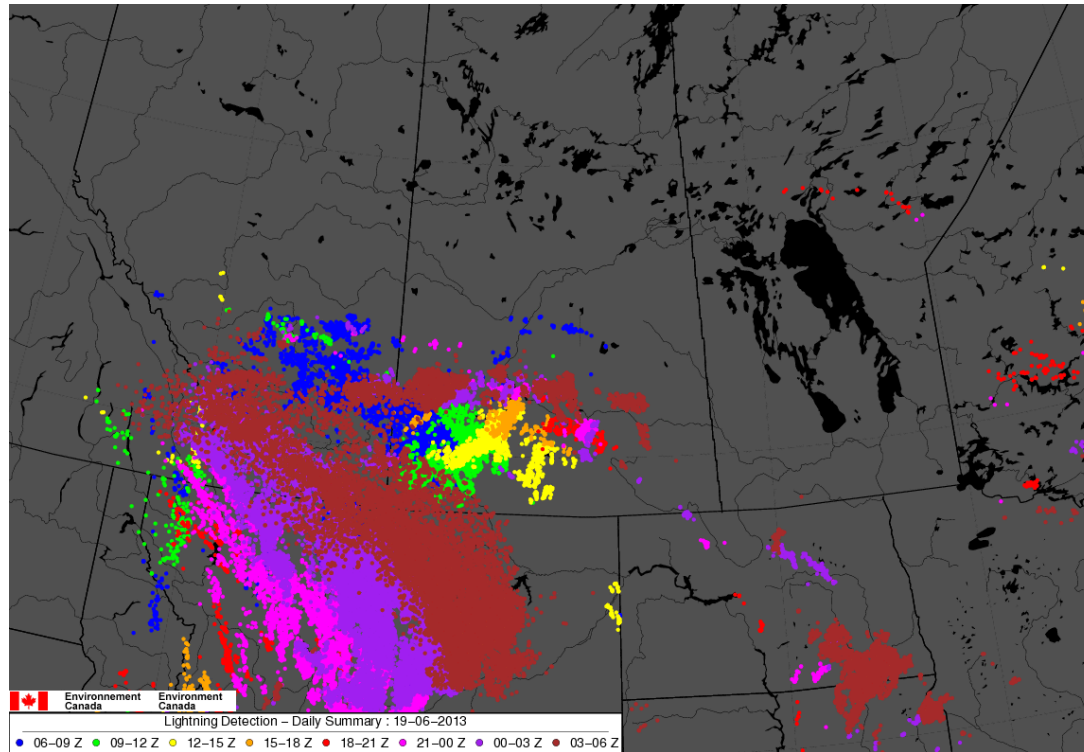
Composite

1320 UTC

June 21



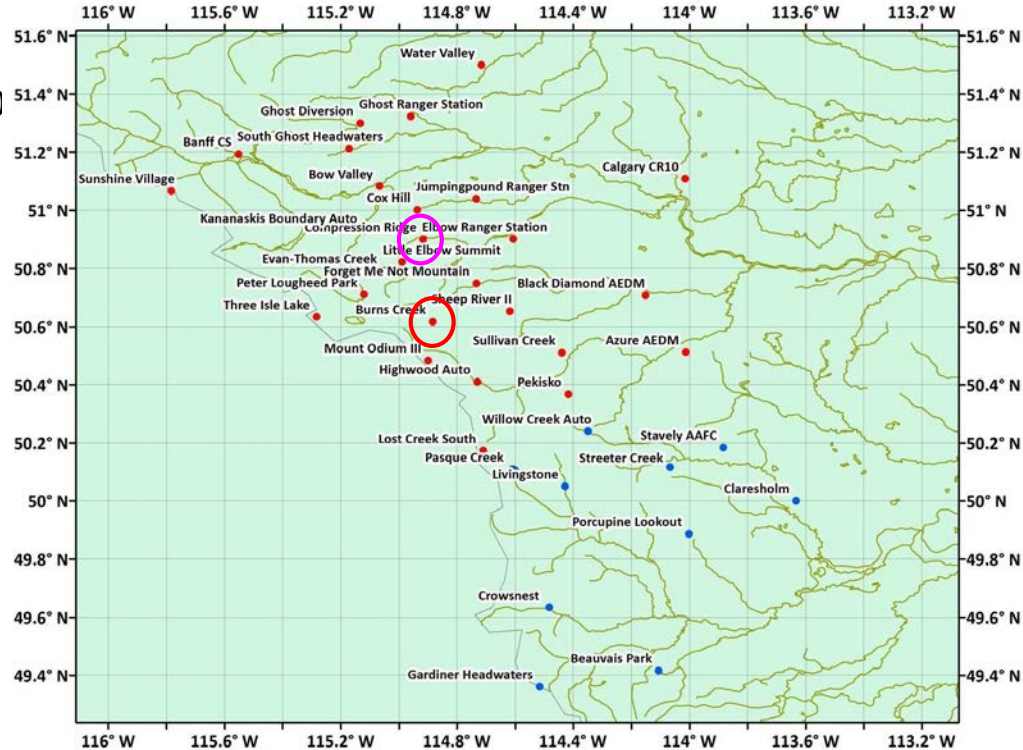
Lightning Activity June 19 (06 UTC) – June 20 (06 UTC)



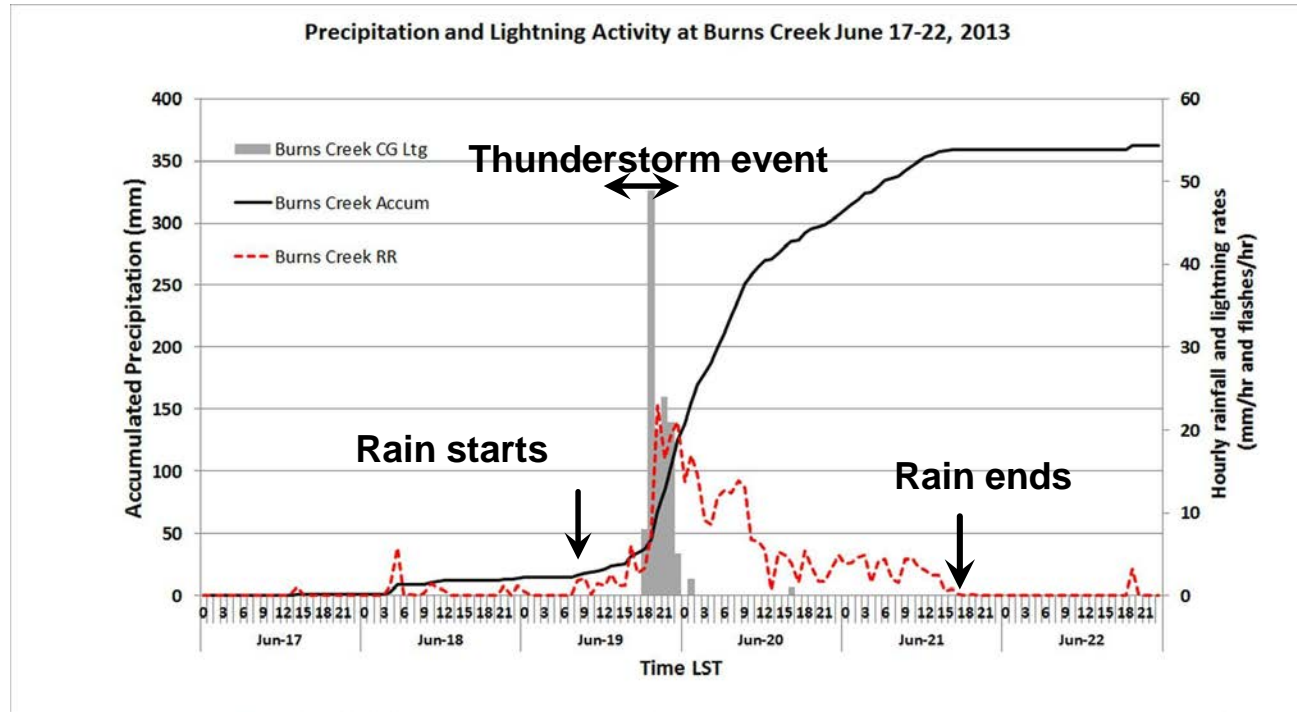
Study Region and Precipitation Stations

red - Bow (27)

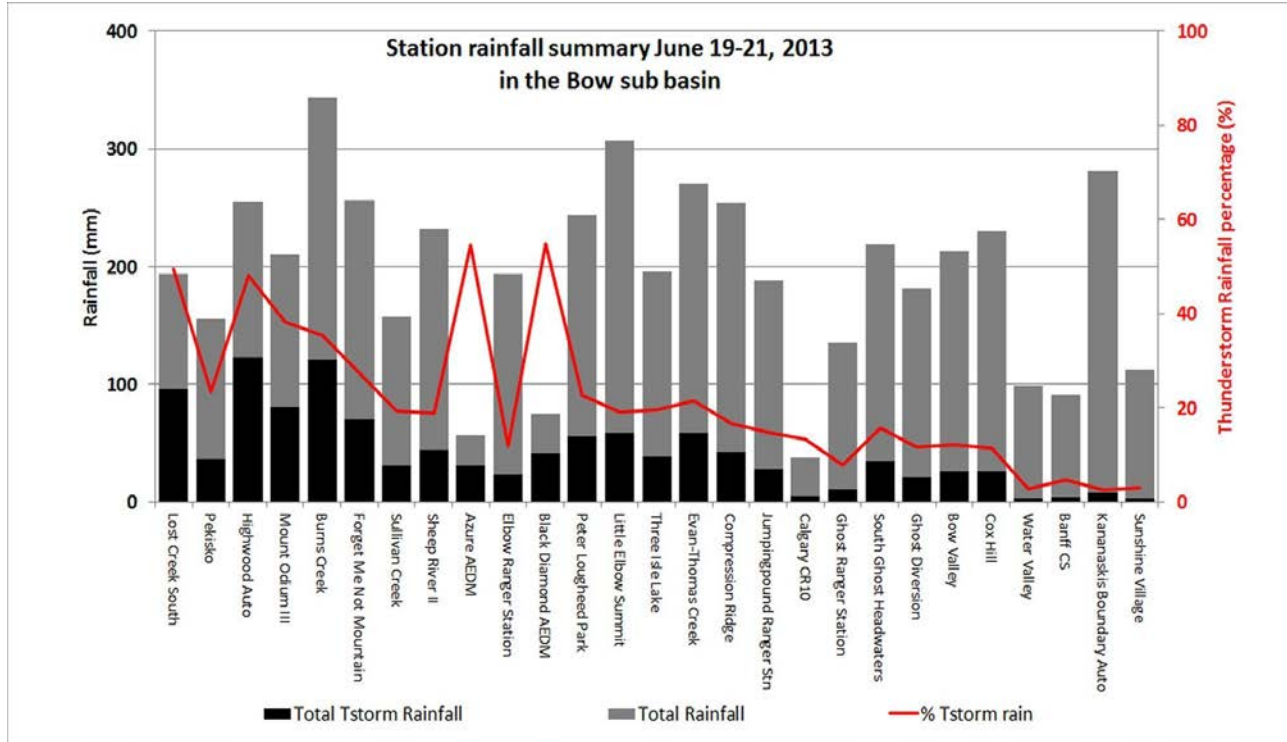
blue - Oldman (10)



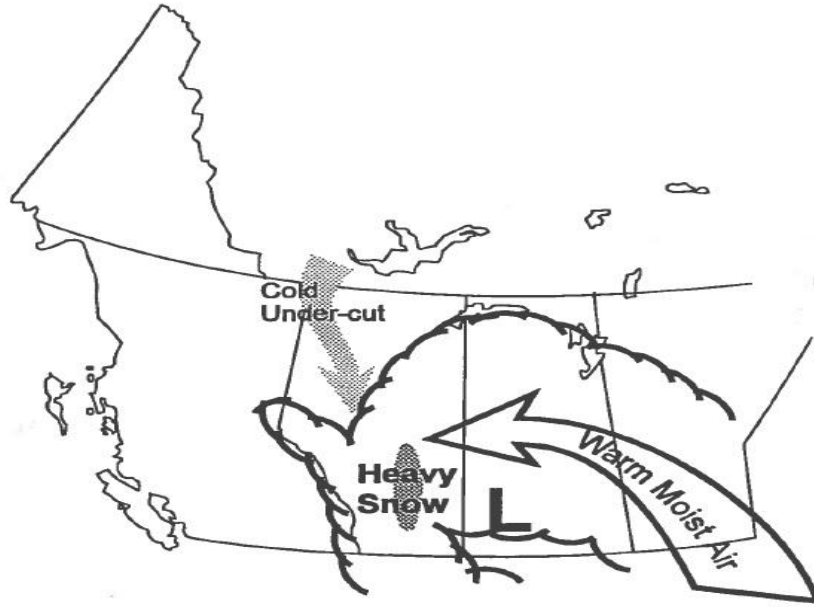
Rainfall and thunderstorm Activity Burns Creek station



Rainfall Summaries in Bow Sub-Basin



Big Precipitation Events



Some Other Recent Floods

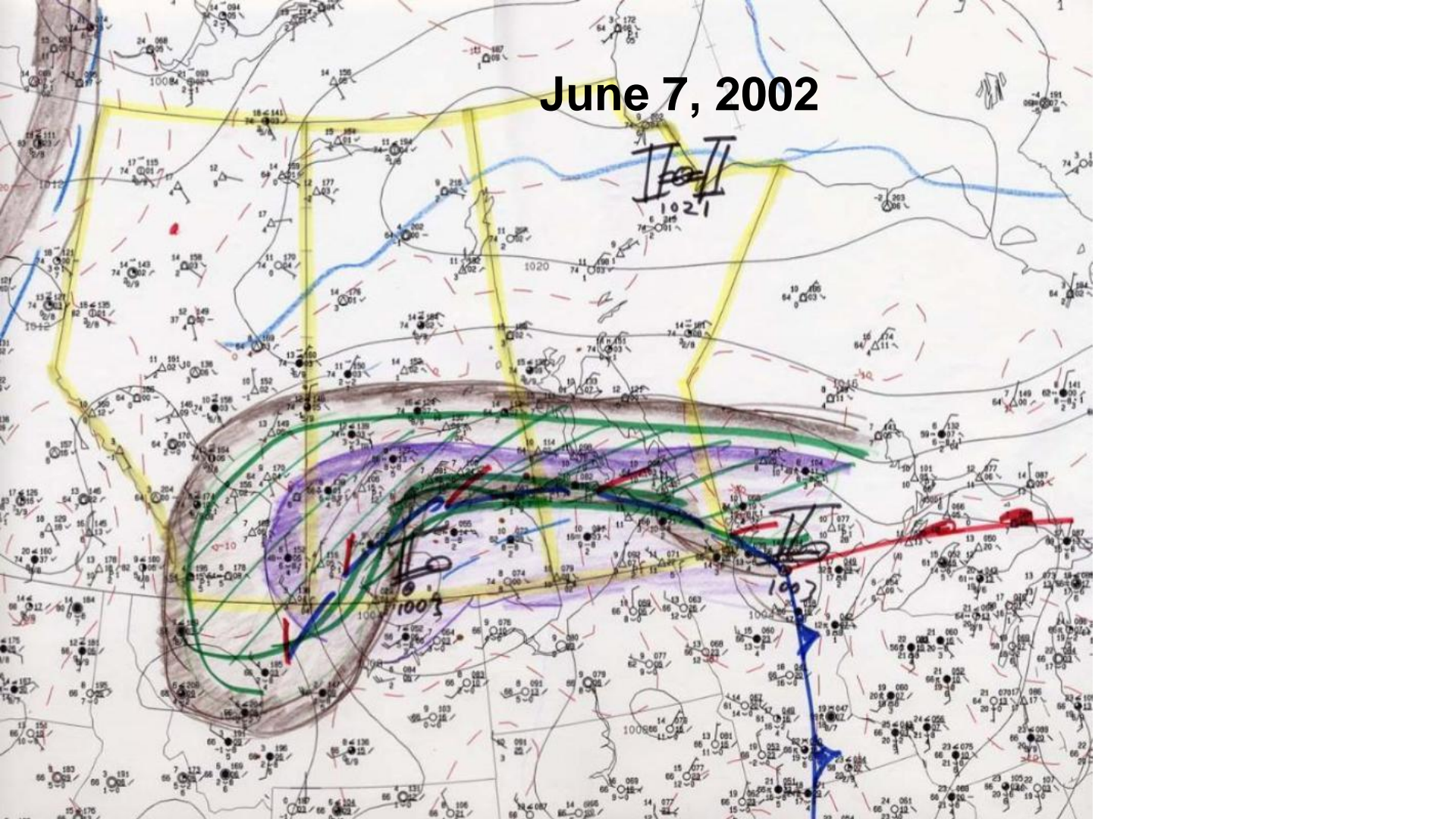
Some simple comparisons:

1995 Oldman River flooding

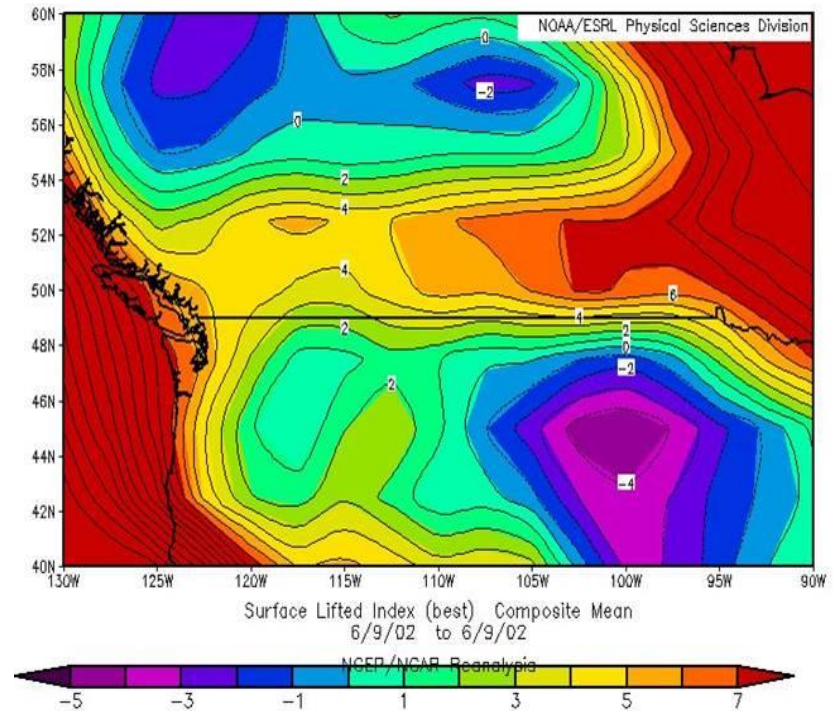
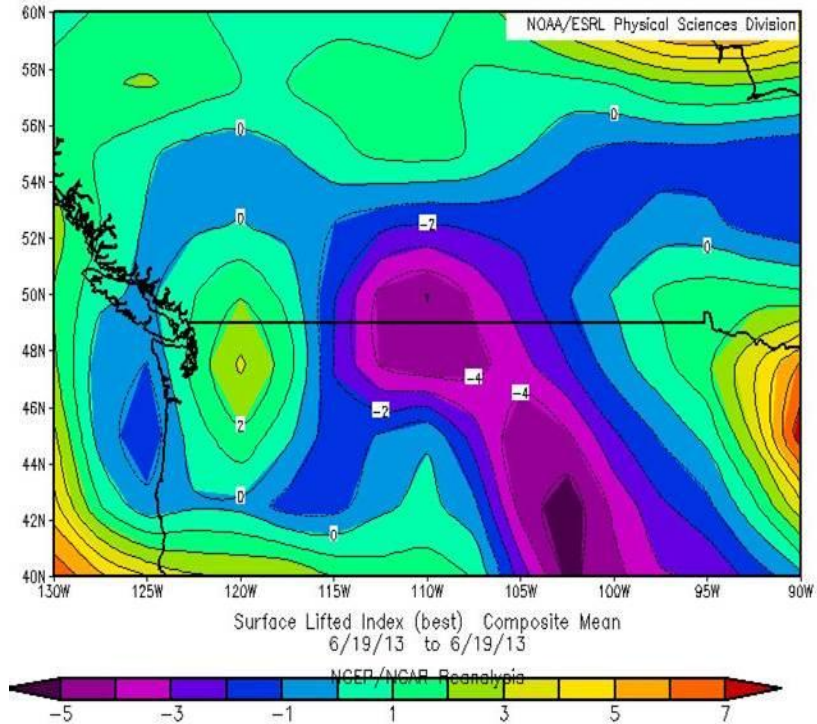
2002 “drought buster”

2005 not as much precipitation in Rockies(?)

June 7, 2002



Evidence of Convective Instability



Storms Producing Large Precipitation 1950-2013

Characteristics of extreme rain events over the western Prairies identified by using rain gauge data

DateStamp	Pmax - NCEP	# of days NCEP Pmax >30mm	Mid-level cutoff Low	Surface Low - lowest centre P and location	Northern high pressure area	dT'/dy across frontal zone	S wet anor
19530602	30	3	Off BC coast	1005 Montana	N moderate	2	-0.0
19540826	40	2	NW US coast	1004 Idaho	NE moderate	5	-0.0
19590626	30	3	BC coast	996 Wyoming	NW weak	7	-0.0
19630622	35	2	NW US coast	995 S Sask	NW weak	4	-0.0
19650625	60	4	BC coast	994 S Sask	NE weak	4	-0.0
19700613	45	1	Nevada	1008 Utah	broad strong	4	-0.0
19700630	30	2	SE BC	998 N Dakota	NE weak	5	-0.0
19730614	70	3	Off BC coast	989 SW Sask	NNE moderate	6	-0.04
19750619	40	2	Nevada	996 Utah	broad moderate	4	-0.0
19880608	45	3	Off NW US coast	1000 SE Sask	NE strong	14	-0.0
19880705	40	3	Off NW US coast	1002 Montana	NE weak	4	-0.0
19980627	35	2	S Sask	1000 Nebraska	NE weak	2	-0.0
20020608	55	4	NW US	995 Nebraska	broad strong	6	-0.0
20050617	45	2	Off NW US coast	1000 Montana	NW weak	8	
20050824	55	2	S Alberta	998 S Sask	broad weak	6	
20130619	45	1	NW US	1004 Col-Montana	broad moderate	6	

SUMMARY

- Preceding winter/spring had above-normal precipitation
- Moisture from southern regions with high melting layer
- Complex evolution of precipitating features
 convection (organized and not) to stratiform
 interaction (and enhancement) with topography
- ‘Small’ region of heavy precipitation
- Similar/different from 2002 event (and others?)

Overall - devastating chain-of-events

Some Questions

- Why so much winter precipitation, how much left to melt?
 - Why did the ‘squall line’ develop, how did it evolve with topography, why was the ensuing precipitation so focussed?
 - Likelihood of persistent precipitation bands over the same area?
 - How much precipitation was farther west and how did this arise?
 - Has such a situation been seen before, why/why not?
 - And, is this event a harbinger of others to come?
 - ...
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