The Development of a "Catalog of Catalogs" for Atmospheric River Data at the Center for Western Weather and Water Extremes (CW3E)

Jon Rutz (jonathan.rutz@noaa.gov), Sasha Gershunov, Scott Sellars, Brian Kawzenuk, Marty Ralph, Tamara Shulgina

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Outline

- Motivation
  - Why do we need "catalog of catalogs" for AR data?
  - What are the benefits?

- Project Goals
  - What are the desired outcomes?
  - What are the stages of development?

- Sample Data
  - Timeseries
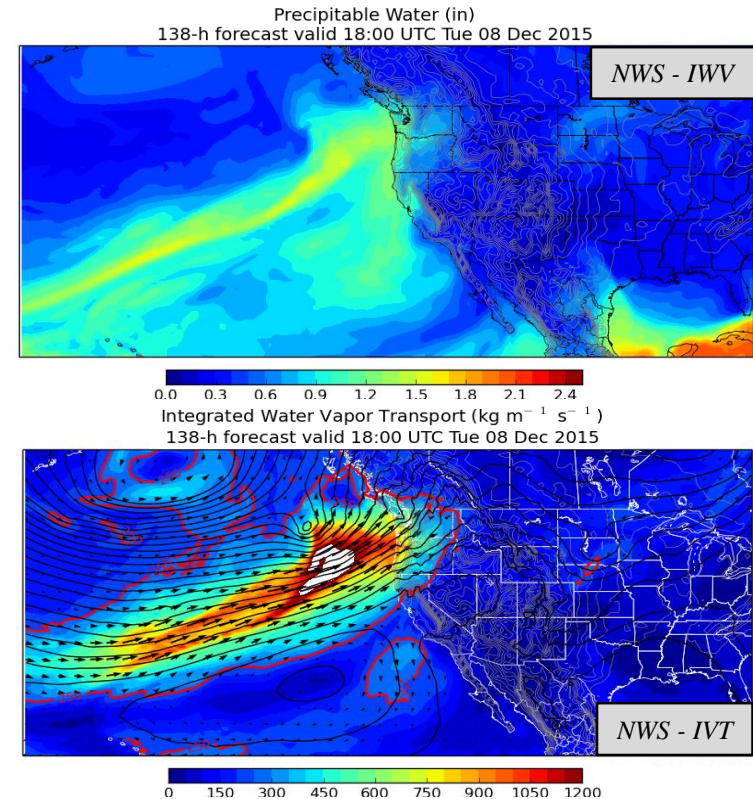 - Statistics
  - Visualization

- Summary

Motivation

- Atmospheric Rivers (ARs) can be generally defined as elongated regions of enhanced vertically-integrated water vapor transport (IVT)
    - **Long (> 2000 km)**
    - **Narrow (< 1000 km)**
    - **Large IVT (> 250 kg m^{-1} s^{-1})**
    - Many here will say, "I know it when I see it"

Cliff Mass Blog

Ralph et al. 2004, MWR

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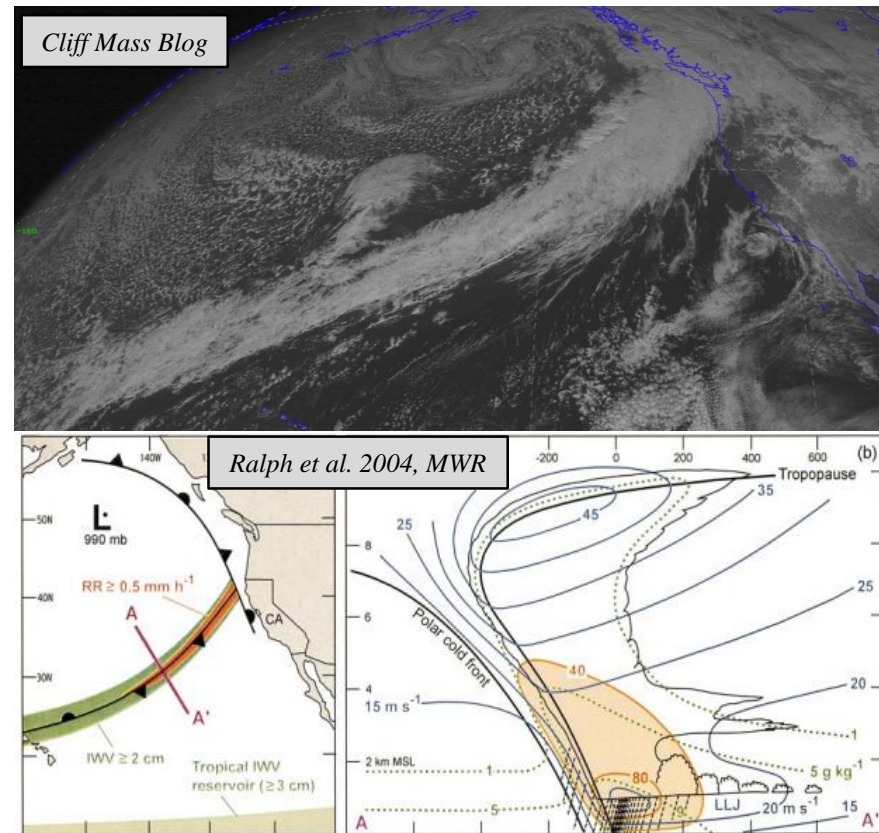
Motivation

- Numerous AR identification methods using different criteria
  - Thresholding Variables
    - IWV vs. IVT
  - Values vs. Percentiles
    - 250 kg m^{-1} s^{-1} vs. 85%ile IVT
  - Threshold Magnitude
    - 15 mm vs. 20 mm
  - Geometry
    - Length: 1500 km vs. 2000 km
      - Point-to-point or following feature curvature
    - Width: 1000 km vs. no requirement
    - Aspect ratio: 2/1?
  - Different Data Sets

Precipitable Water (in)
138-h forecast valid 18:00 UTC Tue 08 Dec 2015

NWS - IWV

0.0 0.3 0.6 0.9 1.2 1.5 1.8 2.1 2.4

Integrated Water Vapor Transport (kg m^{-1} s^{-1})
138-h forecast valid 18:00 UTC Tue 08 Dec 2015

NWS - IVT

0   150   300   450   600   750   900 1050 1200

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Motivation

- Why does all of this matter?
  - The AR definition affects the AR climatology and the attribution of impacts to ARs
    - Changes in AR climatology and AR-related impacts seen in climate studies will be sensitive to the AR definition as well, and this affects how we plan
    - Comparing different "catalogs" of ARs will likely offer insight into which offer the most useful perspectives (i.e., which ones capture the impacts)
  - Examples of definition-sensitive impacts…
    - AR duration (highly correlated with precipitation)
    - Fraction of precipitation attributable to ARs
    - Western U.S. avalanches
    - Floods

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Motivation

- The research community would greatly benefit from a one-stop resource for obtaining, comparing, and viewing data related to the various methods and data sets used to analyze ARs

- Not so much about agreeing on a definition, as fostering a testbed of sorts where ideas continue to be tried, examined, compared, etc.

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Project Goals

- A "catalog of catalogs" for ARs and AR-related phenomena
    - Different data sets, AR identification methods, and regions
    - All referenceable
- Data types
    - Time series, statistics, interactive graphics
- Studies, publications, and presentations
- Overall Usefulness

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Project Goals – Tier 1

- Organizational Framework
  - Dedicated web page
  - Plan for obtaining, storing and organizing the various data sets… including data format and retrieval options
  - Plan for how the catalog will be updated (i.e., will someone from CW3E make all updates or will any contributors be able to make updates?)
  - Availability of a few initial data sets' time series and statistics…(mostly in text format)

Project Goals – Tier 2

- Expansion of Catalog
  - Active solicitation of additional data sets, perhaps as part of an announcement / short news article (e.g., BAMS)
  - Expanded options for data formatting and retrieval
  - Planning and initiation of broad, comparative studies

Project Goals – Tier 3

- Interactive Graphics Capabilities
  - Develop the ability for users to perform interactive plotting of ARs, IVT, IWV, and perhaps other relevant fields
  - Plotting will be based on users' choice of data set, date, domain, and AR identification method
  - Another announcement may be warranted at this stage

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Sample Data

- http://www.inscc.utah.edu/~rutz/ar_catalogs/

Sample Data – Timeseries
(NCEP/NCAR – 125ºW, 40ºN)

yyyy	mm	dd	hh	AR?	new AR?	AR duration	ivt	AR-total ivt
2010	12	2	0	0	0	0	201.13	0.00
2010	12	2	6	0	0	0	228.36	0.00
2010	12	2	12	0	0	0	233.34	0.00
2010	12	2	18	0	0	0	245.14	0.00
2010	12	3	0	1	1	6	262.65	262.65
2010	12	3	6	0	0	0	127.45	0.00
2010	12	3	12	0	0	0	85.17	0.00
2010	12	3	18	0	0	0	99.15	0.00
2010	12	4	0	0	0	0	160.17	0.00
2010	12	4	6	0	0	0	217.74	0.00
2010	12	4	12	0	0	0	226.92	0.00
2010	12	4	18	1	1	6	283.21	283.21
2010	12	5	0	0	0	0	221.30	0.00
2010	12	5	6	0	0	0	231.03	0.00
2010	12	5	12	0	0	0	193.20	0.00
2010	12	5	18	1	1	6	303.57	303.57
2010	12	6	0	1	0	12	384.44	688.01
2010	12	6	6	1	0	18	278.72	966.73
2010	12	6	12	1	0	24	253.21	1219.94
2010	12	6	18	1	0	30	466.48	1686.43
2010	12	7	0	1	0	36	423.22	2109.65
2010	12	7	6	1	0	42	503.52	2613.17
2010	12	7	12	1	0	48	545.72	3158.89
2010	12	7	18	1	0	54	613.20	3772.09
2010	12	8	0	1	0	60	549.51	4321.60
2010	12	8	6	1	0	66	653.94	4975.54
2010	12	8	12	1	0	72	347.40	5322.94
2010	12	8	18	0	0	0	235.20	0.00

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Sample Data – Statistics
(NCEP/NCAR – 125ºW, 40ºN)

	# 6-h AR periods	# AR events	AR frequency (%)	mean AR duration (h)	mean AR-total ivt
January	2126	434	25.21	29.41	2037.06
February	1641	366	21.36	27.22	1850.26
March	1416	413	16.79	20.48	1294.83
April	946	284	11.59	19.98	1161.79
May	901	265	10.69	20.28	1170.84
June	978	269	11.99	21.77	1233.89
July	273	107	3.24	14.95	791.94
August	344	125	4.08	16.18	856.79
September	648	215	7.94	18.11	1018.71
October	1413	372	16.76	22.75	1432.42
November	2157	482	26.43	26.67	1814.66
December	2273	486	26.96	27.74	1967.94
Annual	15116	3818	15.22	23.75	1535.00

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Summary

- A "catalog of catalogs" for AR data will be developed at CW3E
  - Will serve as a baseline for comparisons between AR climatologies based on different identification methods and data sets
  - Will include time series, statistics, and eventually graphics capabilities for obtaining and viewing information relevant to ARs
- Admittedly very early in this process
  - Some sample data is available, but not yet at CW3E web page

- **If you've developed an objective method for identifying ARs, please think about how you could contribute**

- Questions? **jonathan.rutz@noaa.gov**

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