



Environmental Stewardship and Climate Datasets



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High School Streams Project
VT EPSCoR RACC

June 29, 2012

- Earth sustains life
- Weather changes fast
- Climate changes slowly
- Greenhouse gases keep Earth warm
- Burning fossil fuels – coal, oil and gas – is having a big effect on climate by increasing greenhouse gases: CO₂ and H₂O



January 2, 2012: NASA

Will Attitudes Change?

- **Changing climate and extreme weather will raise awareness**
- **'Managing' Lake Champlain is a microcosm for 'managing' the Earth**

Environmental Stewardship

- **You will understand how humans interact with the Lake Champlain Basin**
- **And that understanding will give you the tools and the responsibility to be environmental stewards**

The CO₂ Problem Looks Insoluble?

- **The CO₂ problem looks insoluble (and the consequences bleak) (and the political system paralyzed)**
- **Is it hopeless???**

The CO₂ Problem Looks Insoluble?

- The CO₂ problem looks insoluble (and the consequences bleak) (and the political system paralyzed)
- Is it hopeless??? **Not at all!**
- **Hope is central as it opens doors to creativity and possibilities that we cannot yet imagine**
- **We are active participants in the creation of the future – it is not under our ‘control’ but nothing is a foregone conclusion**

Exxon-Mobil's View (6/27/2012)

- Exxon-Mobil CEO, Tillerson, in a break with predecessor Lee Raymond, has acknowledged that global temperatures are rising. **"Clearly there is going to be an impact,"** he said Wednesday.
- He said that people would be able to adapt to rising sea levels and changing climates that may force agricultural production to shift.
- "We have spent our entire existence adapting. We'll adapt," he said. **"It's an engineering problem and there will be an engineering solution."**

Just an Engineering Problem?

- **Parts can be solved by engineering**
- **Much of the Earth's biosphere cannot be 'engineered' – and this includes humanity**

Waste Streams



Western North Pacific Gyre Expedition



Dates: May 1 – May 20, 2012

- **Thrown into the frozen flood plain of the Otter Creek**
- **Around 10 million tonnes of plastic ends up in the sea.**
- **Ends up on beaches and in one of the five ocean gyres as plastic fragments**

How Do We Manage the Earth?

(When there is so much we don't know)

- **Need a long time horizon:**
 - **Generational to century (*Forest timescale*)**
- **We need some new rules / guidelines**
 - **Our numbers are so great**
 - **Our industrial impact is too large**
 - **Much of the Earth cannot be engineered**

Engineering Guidelines to Minimize Human Impacts

- **Minimize the lifetime of human waste-streams** in the Earth system and eliminate waste with critical biosphere interactions
- **Minimize the use of non-renewable raw materials, and**
- **Maximize recycling and re-manufacturing**
- **Maximize the efficiency** with which our society uses energy and fresh water, and
- **Maximize the use of renewable resources**

Examples of Long-Lived 'Waste'

- **CO₂ from fossil fuels** – lifetime centuries
– greenhouse gas (that with water vapor greenhouse and ice-albedo feedbacks) pushes earth to warmer climate
- **CFCs** – refrigerants – lifetime centuries -
broken down by sunlight in stratosphere
– catalyze destruction of ozone that protects earth from UV. (1989 Montreal protocol phase-out avoided UV

Greater Efficiency Critical

- **We need to double or triple our energy efficiency because...**
 - **We cannot replace current fossil fuel use with biofuels & renewable energy**
 - **Oil and gas reserves are limited, but coal & oil shale reserves are sufficient to push CO₂ to 1,000 ppm—and in time melt icecaps**
 - **How much CO₂ can we “sequester” back in the earth?**

As climate changes....

- **Everything is interconnected**
- **Human society and waste streams: people's choices, actions and adaptations**
- **Precipitation, seasons, streams, and forests; habitat and wildlife; biosphere's adaptation**

- **You have specific tasks in a large project**
- **But keep your eyes open to the big picture and draw connections**
- **Record more than the project lists/protocols**
- **Keep sharing your discoveries and asking us for guidance**

Climate Data Sets

- **A sea of WEB sites (see list) – weather data came first, so ‘climate data’ is often buried (*And Congress has refused to set up proper climate service – guess why!*)**
- **New datasets every year**
- **What would help you understand the data you are collecting?**
- **What would be interesting to connect?**

Weather, Climate and Educational Websites

- **National Weather Service/Burlington, Vermont:**
<http://www.erh.noaa.gov/er/btv>
- National Weather Service/Albany, New York:
<http://www.erh.noaa.gov/er/aly>
- National Weather Data: weather.gov
- (Climate Diagnostics center www.cdc.noaa.gov?)

- **Vermont State Climate Office**
<http://www.uvm.edu/~vtstclim/>
- **Climate Context: NCDC**
<http://www.ncdc.noaa.gov/climate-monitoring/index.php>

- *Your specific need – Browse and then ASK!*

Vermont State Climate Office

<http://www.uvm.edu/~vtstclim/>

- **Leslie-Ann has collected many links**

under data



:: UVM Home
:: Vermont State Climate Office ARSCO
News - Tropical Storm Irene flooding - resources
Lake Champlain 2011 flooding - resources & context
State Climatologists in Burlington
Data <ul style="list-style-type: none">· Forecasts· Long Term Records· Historical Data Project· Data Finding Tips· Vermont Data Agencies· Other
Climate Change
Climate Literacy

Vermont State Climate Office ARSCO

Daily Weather and Climate around Vermont

Explore a variety of weather/climate-related activities...

Current weather, river, and air trajectory conditions

- National Weather Service/Burlington, Vermont
- National Weather Service/Albany, New York
- VT Forecast & Daily Summary from IWIN/National Weather Service
- National Weather Service - Three-day city forecasts
- Lake Champlain & Colchester Reef data/National Weather Service
- National Weather Service KCXX radar Burlington, Vermont
- NOAA Cooperative Institute for Regional Prediction - current precipitation summary
- NOAA Cooperative Institute for Regional Prediction - current Vermont weather data
- Weather data for the current & last month & year in Vermont/National Weather Service
- Regional Climate Center ACIS maps - preliminary data used
- National Weather Service - Vermont river stages
- USGS Water Watch
- USGS Water Alert
- VTrans Road Weather Conditions (webcams)
- Air trajectory and ozone forecasts for the northeast U.S.
- Environmental Protection Agency - New England region

Museums, data centers & Meteorology programs

- The Fairbanks Museum and Planetarium
- Green Mountain Audubon Society
- Northeast Regional Climate Center
- Lyndon State College - Meteorology Program

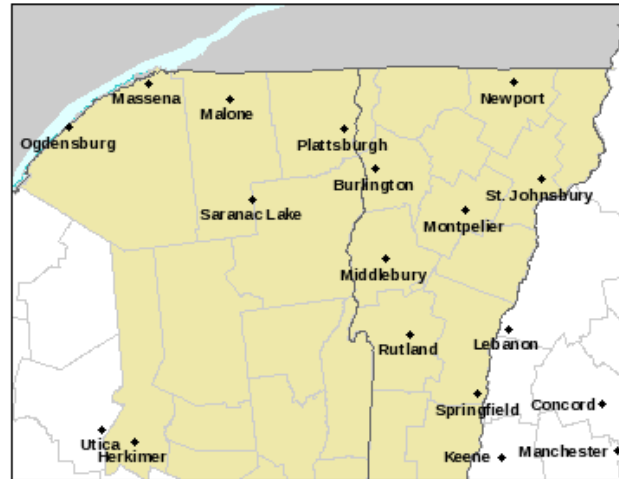
NWS-BTV

(Chuck McGill)

- Submit Storm Report
- Current Conditions
- Cameras
- Coop Observer Obs
- Mesoscale Analysis
- Radar
- Rivers & Lakes
- Road Conditions
- Satellite
- Snow Info
- Spotter Reports
- Forecasts
- Activity Planner
- Area Discussion
- Aviation
- Fire Weather
- Lake Champlain
- Mountain Wx
- Severe Weather
- Winter Weather
- Wireless Wx
- XML/RSS Feeds
- Model Data
- Bufkit
- Lake Models
- Local WRF
- Models
- NCEP Models
- Climate
- Local
- National
- More...
- Weather Safety
- NOAA Wx Radio
- Skywarn™
- CoCoRaHS
- Storm Ready
- Miscellaneous
- Canadian

- Local Climate

Format: 7-Day Forecast Hourly Weather Graph Tabular Quick (land only)



Last map update: Thu, Jun. 28, 2012 at 9:25:07 am EDT

Quick Jump to Popular Links:

Read watches, warnings & advisories

Hazardous Weather Outlook

Latest Conditions in Burlington, Vermont as of 9:00 AM EDT Thu Jun 28 2012

65 ° F (18 ° C) **Partly Sunny** Dewpoint: 59 ° F Wind: S7 mph Humidity: 81 % Pressure: 29.76S

Vermont Regional Weather Roundup as of 9:00 AM EDT Thu Jun 28 2012

Location	Sky & Wx	Tmp (°F)	DP (°F)	RH (%)	Wind (mph)	Pres (in)	Remarks
Montpelier, VT	CLOUDY	62	55	77	CALM	29.81R	
Morrisville, VT	PTSUNNY	67	55	65	VRB3	29.77S	
St. Johnsbury, VT	N/A	64	56	75	MISG	29.74S	
Rutland, VT	SUNNY	64	52	63	CALM	29.78F	
Springfield, VT	MOSUNNY	68	53	58	CALM	29.77F	
Plattsburgh, NY	CLOUDY	66	59	78	SE3	29.74F	
Saranac Lake, NY	SUNNY	63	55	75	SW8	29.80S	
Massena, NY	SUNNY	66	56	70	S7	29.77F	
Mount Mansfield, VT	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Colchester Reef	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Monthly Climate Data (5yr)

Observed Weather	Climate Locations	Climate Prediction	Climate Resources	Local Data/Records	Astronomical	NOWData
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Observed Weather Reports

1. Product » <input type="radio"/> Daily Climate Report (CLI) <input checked="" type="radio"/> Preliminary Monthly Climate Data (CF6) <input type="radio"/> Record Event Report (RER) <input type="radio"/> Monthly Weather Summary (CLM) <input type="radio"/> Regional Summary (RTP) Storm Event Database (SPC) Storm Data (NCDC)	2. Location » Burlington Montpelier St. Johnsbury Morrisville Springfield Rutland Plattsburgh	3. Timeframe » <input type="radio"/> Most Recent <input checked="" type="radio"/> Archived Data: June 2012 May 2012 April 2012 March 2012 February 2012 January 2012	4. View » <input type="button" value="Go"/>
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Product Description:

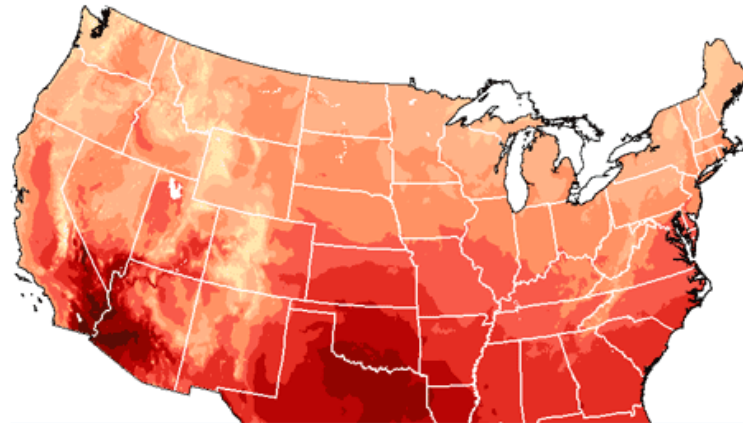
PRELIMINARY MONTHLY DATA (CF6) - updated frequently:
Daily weather statistics for the month, including temperatures, precipitation, degree days, wind and sky cover. In addition, monthly statistics such as average temperatures and departures from normal, degree days, and rainfall are also included. This product is available for up to 5 years.

- **Preliminary data: final archive is at CDC: ask Leslie-Ann or Chuck for guidance**

Climate Context: NCDC

<http://www.ncdc.noaa.gov/climate-monitoring/index.php>

Climate Monitoring
National Oceanic and Atmospheric
Administration
National Climatic Data Center



August Heat Wave

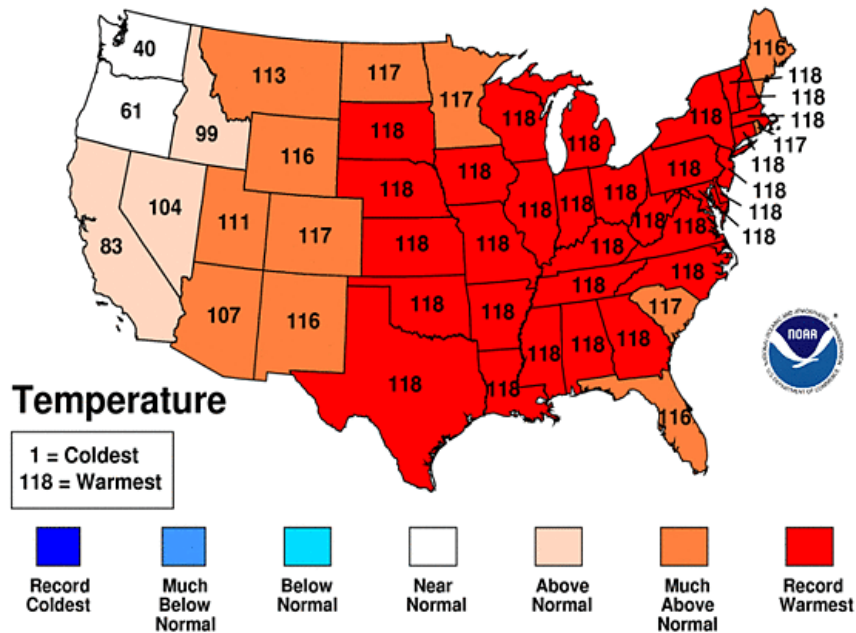
The mean temperature for August (75.7°F/24.3°C) was the second warmest on record. [National Overview](#) » [Climate Report](#) » [August Rank Maps](#) »

- **State of Climate**
- **US products**
- [Climate At A Glance](#)
- [Temperature and Precipitation Maps](#)

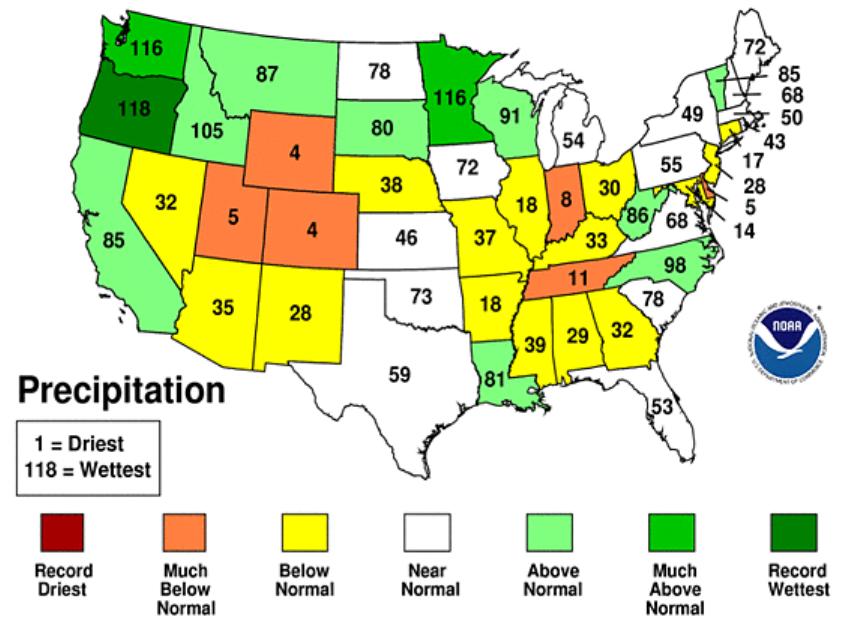
- [State of the Climate](#)
- [U.S. Products](#)
- [Global Products](#)
- [Drought Monitoring](#)
- [U.S. and Global Extremes](#)
- [Hurricanes/Tropical Storms](#)
- [Tornadoes](#)

Temperature and Precipitation Maps

March-May 2012 Statewide Ranks
National Climatic Data Center/NESDIS/NOAA



March-May 2012 Statewide Ranks
National Climatic Data Center/NESDIS/NOAA



- Visual grasp of spring 2012 climate

Other weather data sources

- **As technology gets cheaper, large amounts of weather data are now being collected automatically (typically every 5mins) to monitor conditions on roads, by utilities and by renewable energy installations (interested in the downward solar flux, temperature or wind speeds). Some like the solar flux data (which is an indirect measure of absorption and reflection by clouds and aerosols) have not been available before in the state.**
- **Vermont does not yet have a systematic archive for these data; and the siting and instruments are not 'standard NWS', so you must take care if you use these data.**

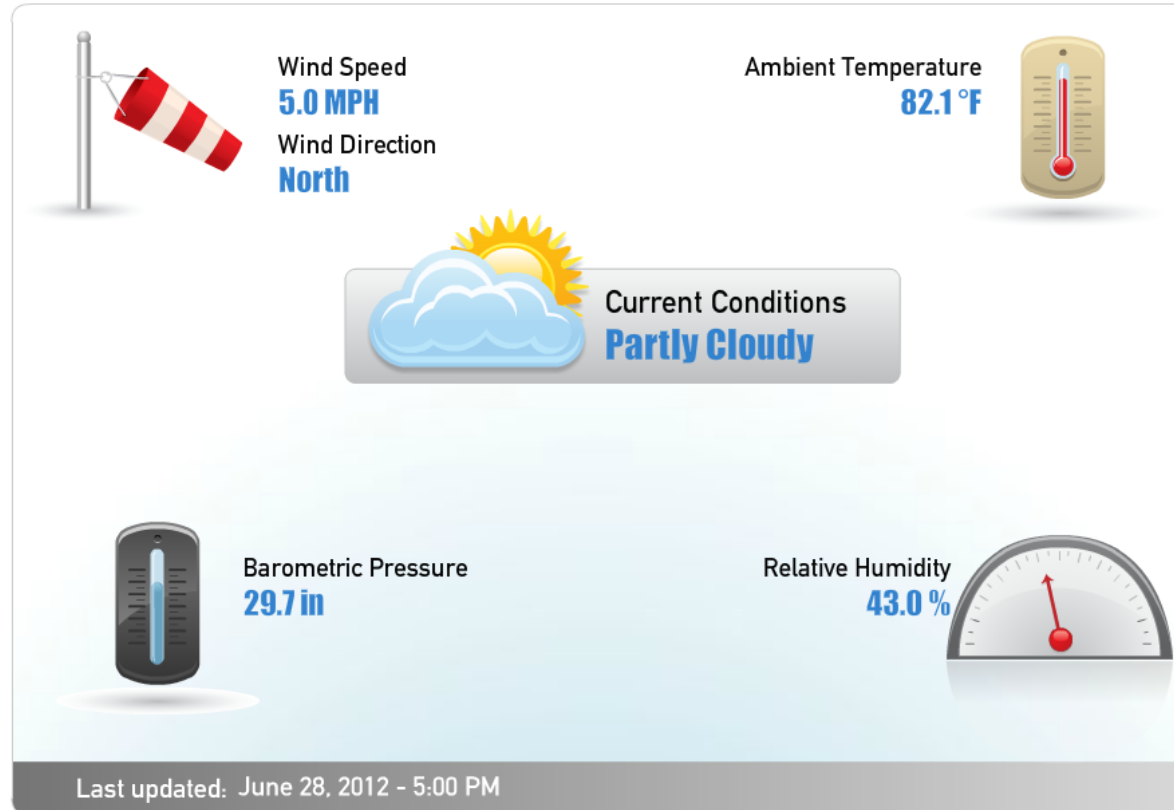
VT has 24 RWIS weather stations

- **Along the main road network: I-89, I-91, Rtes 2, 4, 7, 9, 103.**
- WAS at <http://511.vermont.gov/main.jsf>
- *Maps/data temporally unavailable (since 6/21) – site being redone*

Solar Arrays

Ferrisburgh Solar Farm

Current Weather Conditions in Ferrisburgh, VT



- And downward solar flux = 535.6 W m^{-2}

School in Richmond

Camel's Hump Middle School

100.0 kW
system size AC



T, SW_{dn}

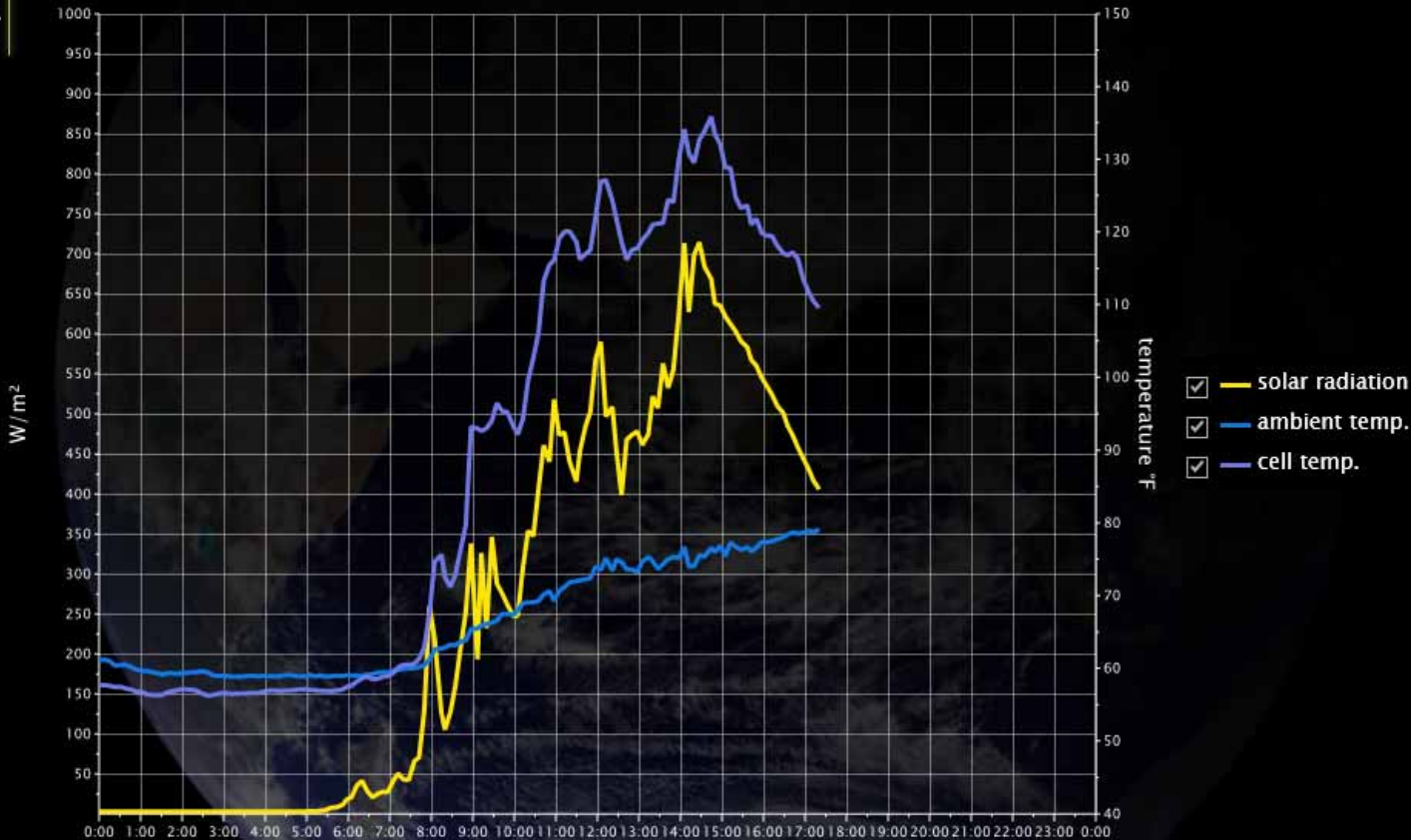
more data

IRRADIANCE AND TEMPERATURE HISTORY

station: WS-48 ▾

zoom to week: 15 <M/d/yyyy> 🔗 📅

June 28 12:00 to June 29 12:00 2012



◀ previous next ▶

Eastern Time (US & Canada)

Without data science is just models in a virtual reality

- What would help you understand the data you are collecting?
- What would be interesting to connect?
- *A specific need – Browse and then ASK!*
- *Look around – we are getting buried in data!*
- *Other RACC scientists please advise on a few data sources relevant to each schools project.*
- *Stay in touch*