Observing System Monitoring Center

Integrating data and information across observing system networks

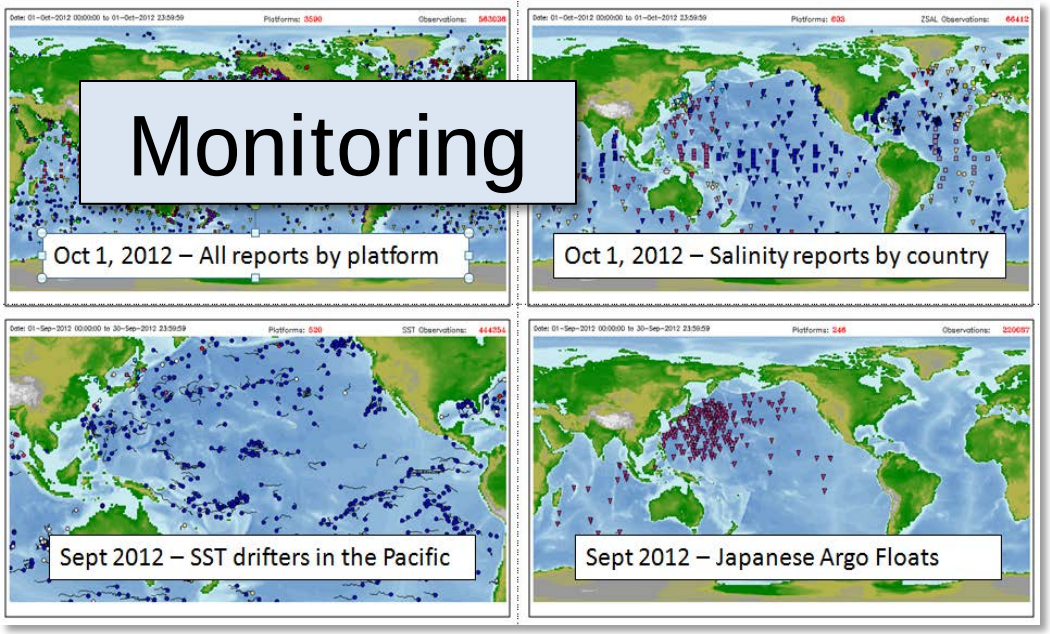
OSMC background

Database of data and metadata *(“realtime”)*

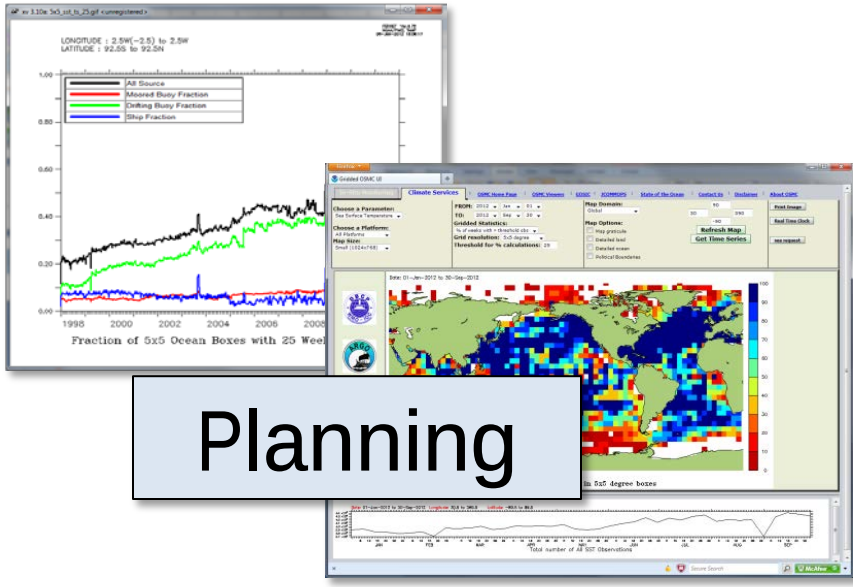
- GTS -- primary source
- Data begins in June, 2004
- ~2 billion observations

OSMC tools

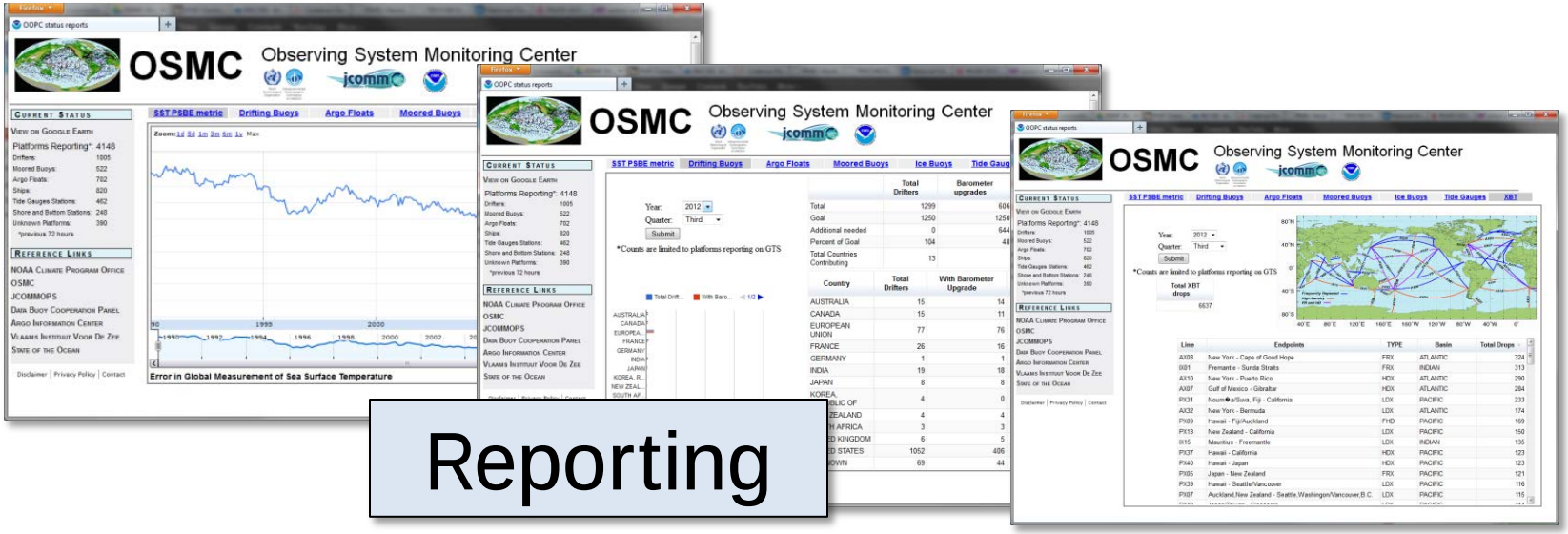
Monitoring



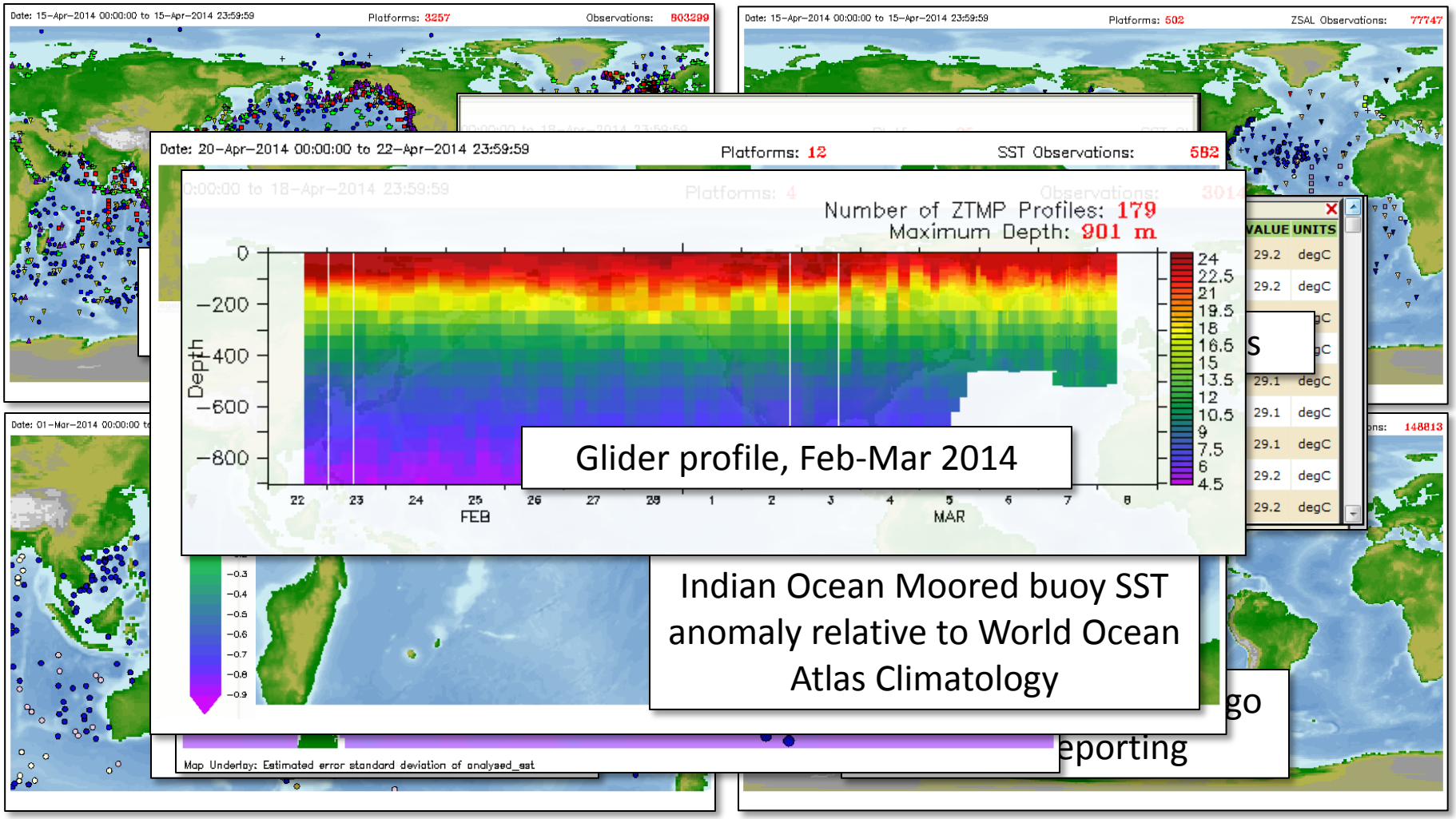
Planning



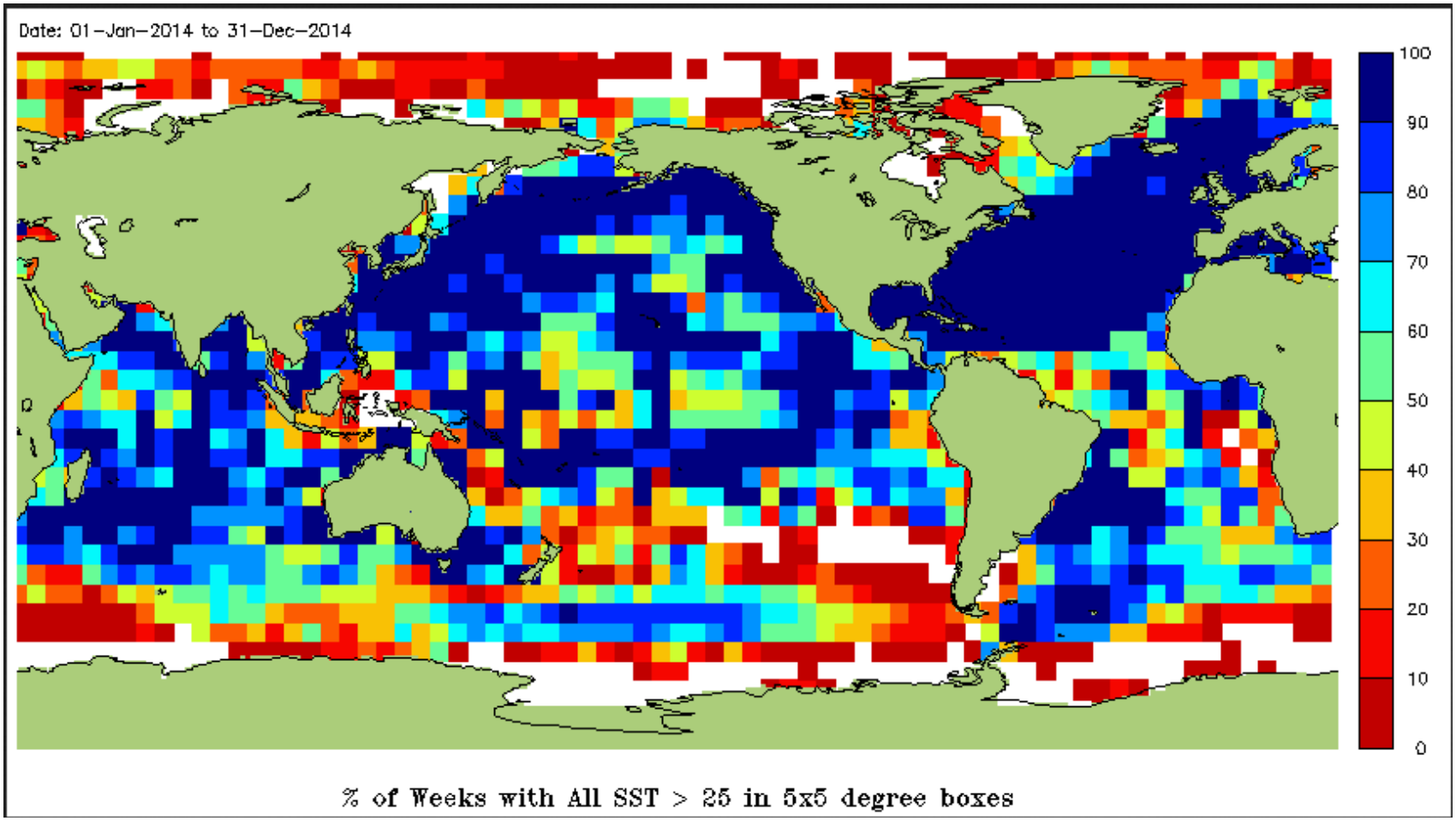
Reporting



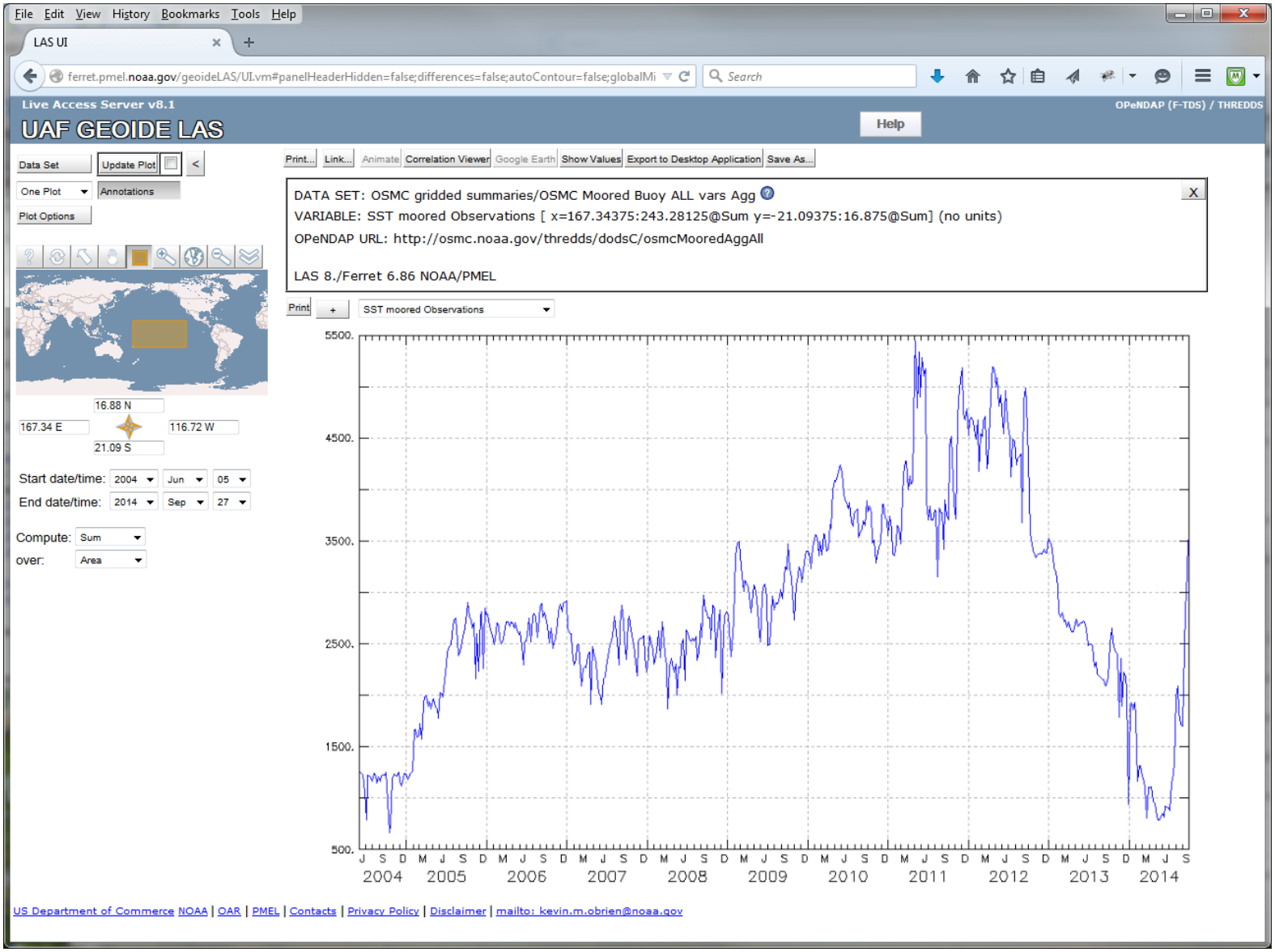
OSMC tools


Date: 15-Apr-2014 00:00:00 to 15-Apr-2014 23:59:59
Platforms: 3257
Observations: 803299
Date: 15-Apr-2014 00:00:00 to 15-Apr-2014 23:59:59
Platforms: 502
ZSAL Observations: 77747
Date: 20-Apr-2014 00:00:00 to 22-Apr-2014 23:59:59
Platforms: 12
SST Observations: 582
Number of ZTMP Profiles: 179
Maximum Depth: 901 m
Depth
0
-200
-400
-600
-800
22
23
24
25
FEB
26
27
28
1
2
3
4
5
6
7
8
MAR
24
22.5
21
19.5
18
16.5
15
13.5
12
10.5
9
7.5
6
4.5
Glider profile, Feb-Mar 2014
Indian Ocean Moored buoy SST anomaly relative to World Ocean Atlas Climatology
Map Underlay: Estimated error standard deviation of analysed_sst
VALUE UNITS
29.2 degC
29.2 degC
29.1 degC
29.1 degC
29.1 degC
29.2 degC
29.2 degC
148813

Metric examples



Summary counts available to other applications



What about the actual data?

- QC'd data can take months to become available
  - Forecast models could utilize NRT data to improve their forecasts
- Can be difficult to obtain (GTS)

- Challenge: provide interoperable access to valuable NRT data
  - With limited funding
  - With limited burden placed upon providers

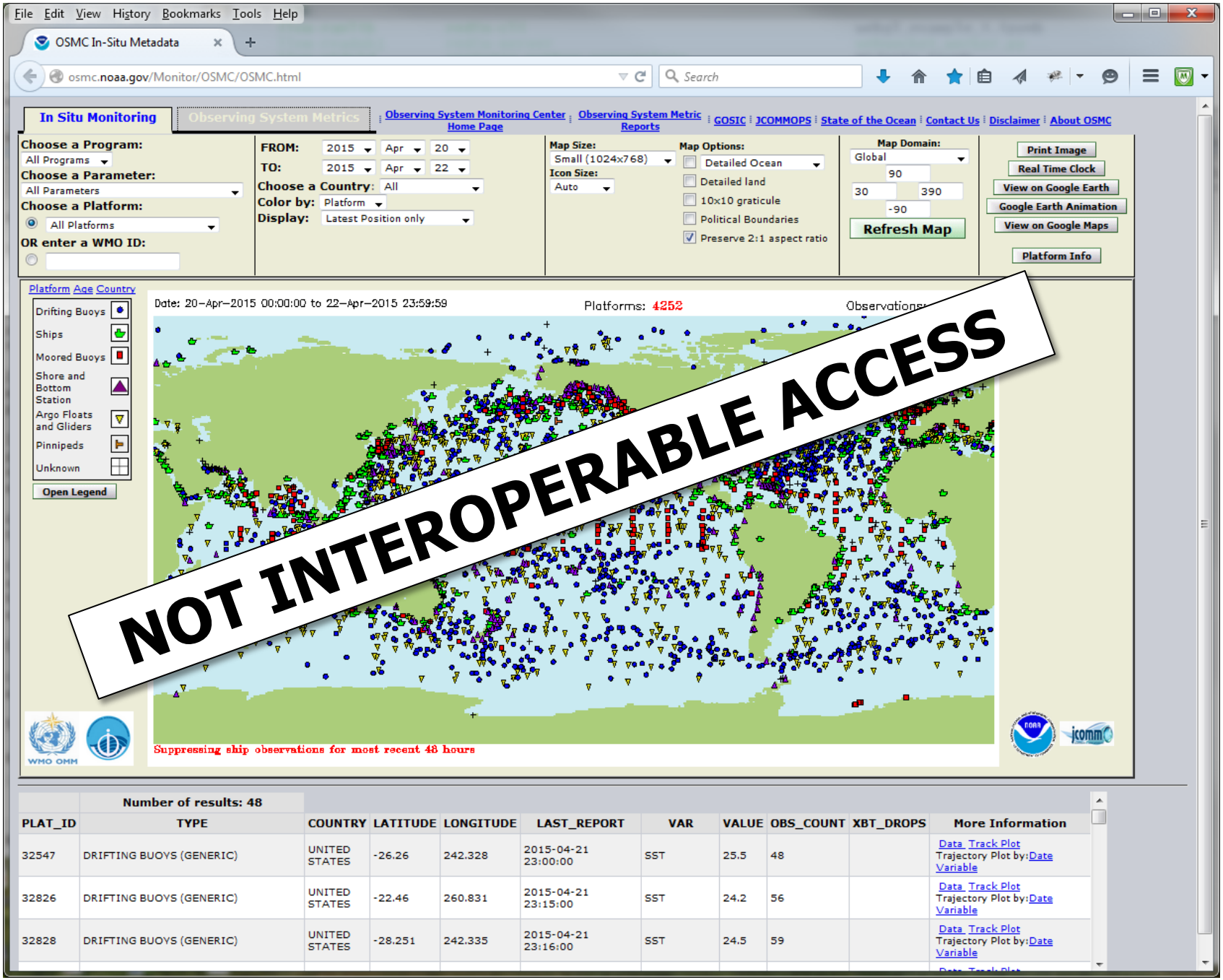
What isn't "integrated data management?"

- A Web page
- Email requests
- A site requiring registration
- An ftp site

Barriers to integration include:

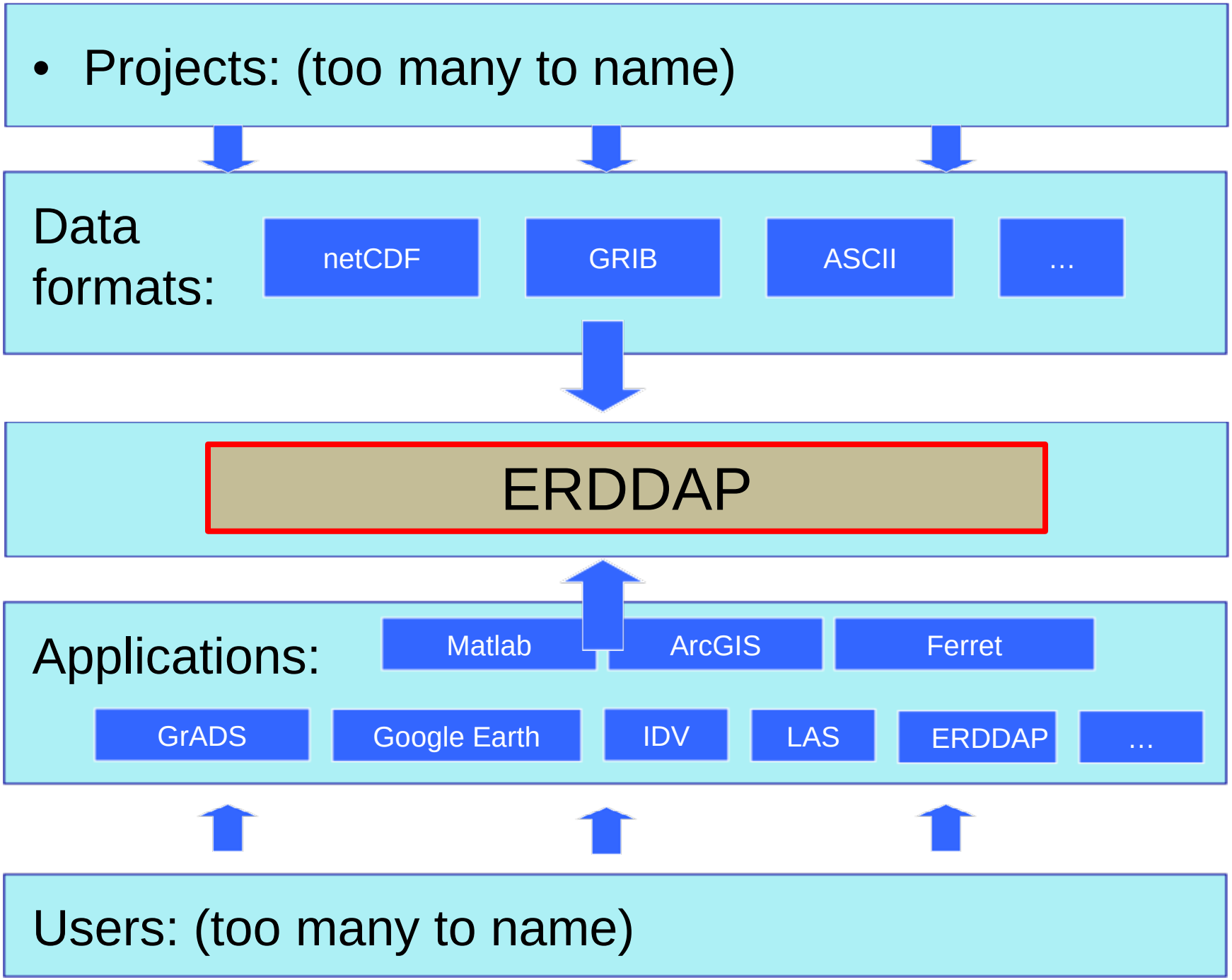
- Stovepipes
- Download required
- Differing formats
- Limited or No machine-machine access

- Users prefer to use tools they are familiar with
- Users want to interact with collections of features
- Users would prefer to not have to fuss over formats
- Users need to find the data



Number of results: 48

PLAT_ID	TYPE	COUNTRY	LATITUDE	LONGITUDE	LAST_REPORT	VAR	VALUE	OBS_COUNT	XBT_DROPS	More Information
32547	DRIFTING BUOYS (GENERIC)	UNITED STATES	-26.26	242.328	2015-04-21 23:00:00	SST	25.5	48		Data Track Plot Trajectory Plot by:Date Variable
32826	DRIFTING BUOYS (GENERIC)	UNITED STATES	-22.46	260.831	2015-04-21 23:15:00	SST	24.2	56		Data Track Plot Trajectory Plot by:Date Variable
32828	DRIFTING BUOYS (GENERIC)	UNITED STATES	-28.251	242.335	2015-04-21 23:16:00	SST	24.5	59		Data Track Plot Trajectory Plot by:Date Variable


• Projects: (too many to name)
Data formats:
netCDF
GRIB
ASCII
…
ERDDAP
Applications:
Matlab
ArcGIS
Ferret
GrADS
Google Earth
IDV
LAS
ERDDAP
…
Users: (too many to name)

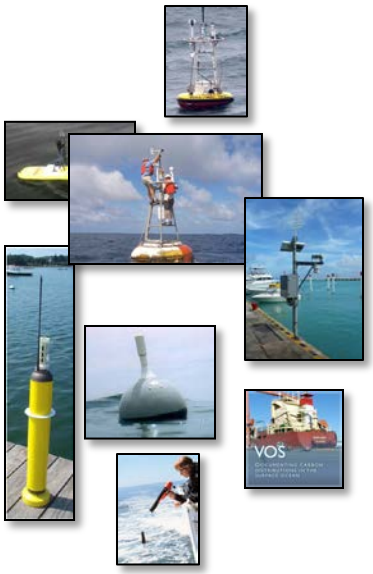
ERDDAP

- Out of NOAA Pacific Fisheries Environmental Lab
- Data server that provides services
- Acts as middleman to reduce complexity when accessing data in many common formats
- Has a Web page for humans, but utilizes RESTful Web services
  - Crucial for machine to machine access
- Multitude of clients can connect and access data through ERDDAP

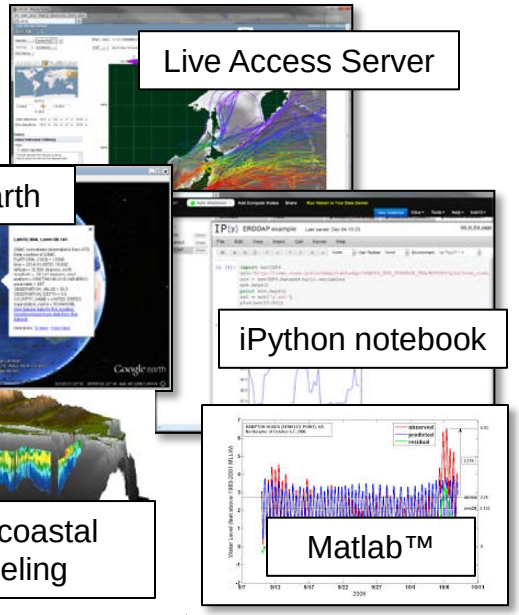
Integration strategy provides multiple access and discovery services for near real time data

GTS

Real time



REST services via OSMC/ERDDAP



Live Access Server

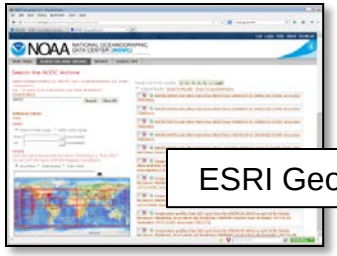
Google Earth

iPython notebook

IOOS coastal modeling

Matlab™

Original metadata can be enhanced at this point, if necessary



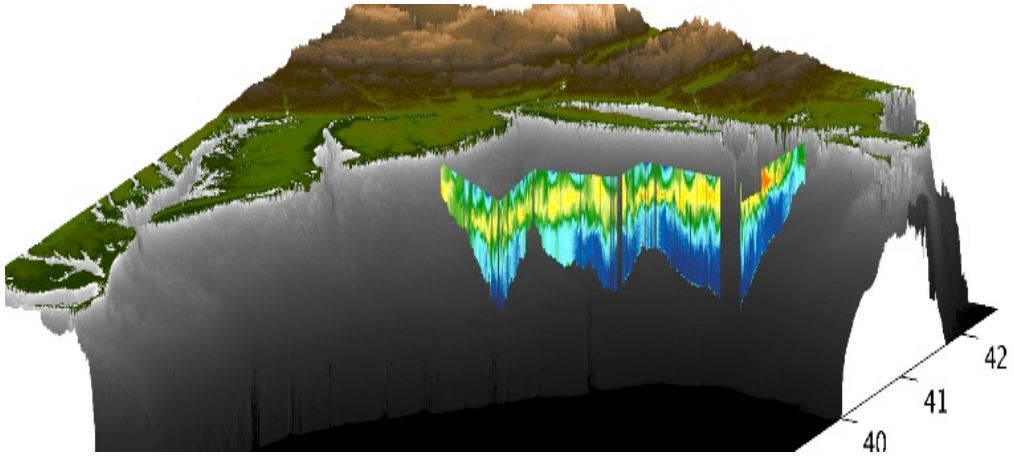
ESRI Geoportal

Data flows directly into users' applications

Accessing the data

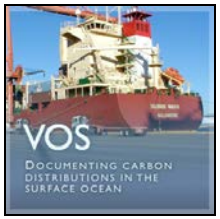
Work flow for real-time ESPreSSO ROMS 4DVar

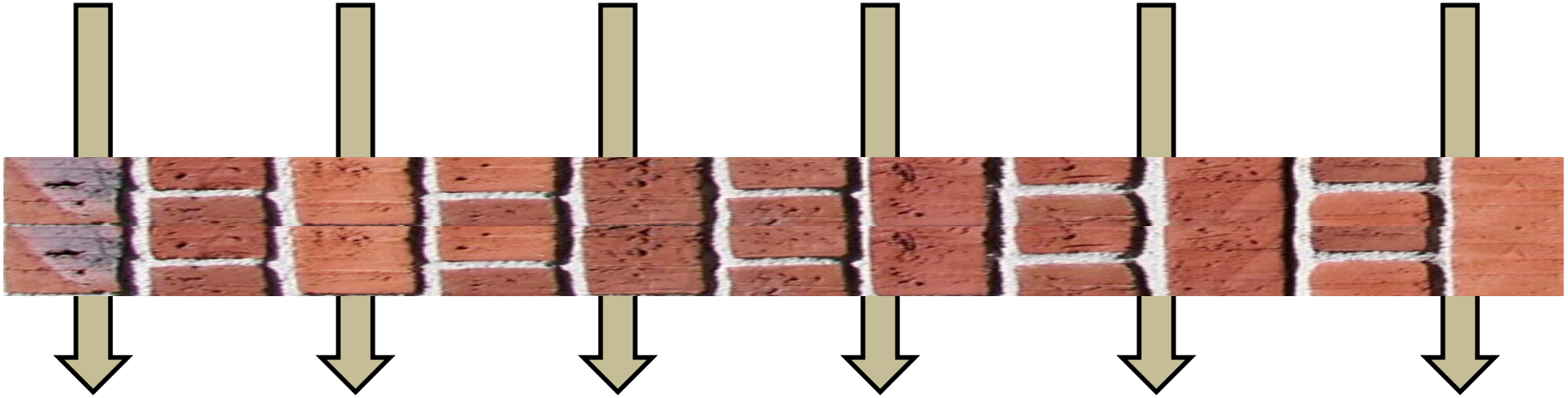
John Wilkin
Rutgers Ocean Modeling Group
MARACOOS



- 72-hour forecast NAM-WRF 0Z cycle at 2 am EST *[NCEP NOMADS]*
- RU regional CODAR product – hourly: 4-hour latency delay *[RU TDS]*
- RU glider T,S when available (seldom) (~ 1 hour delay) *[RU TDS]*
- USGS daily average flow available 11:00 EST *[USGS waterdata]*
- AVHRR IR passes 6-8 per day (~ 2 hour delay) *[MARACOOS TDS]*
- REMSS MW-IR blended SST daily average *[PO-DAAC]*
- HYCOM NCODA 7-day forecast updated daily *[NRL]*
- Jason-2 along-track SLA (4 to 16 hour delay for OGDR) *[RADS]*
- **SOOP XBT/CTD, Argo floats, NDBC buoys on GTS** *[OSMC ERDDAP]*

Integration of delayed-mode data





Data

Data

Data

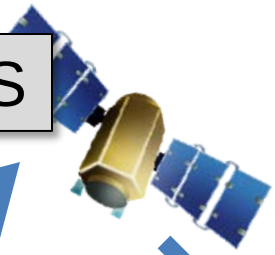
Data

Data

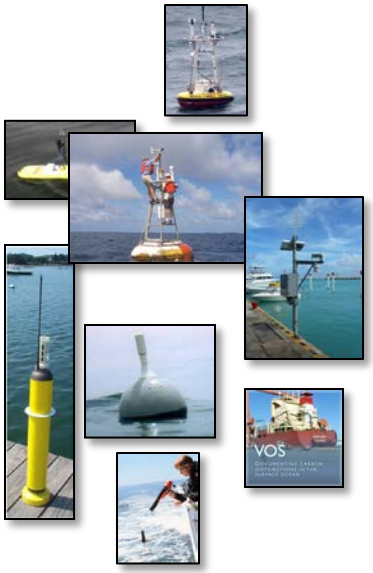
Data

Integration strategy provides multiple access and discovery services for near real time data

GTS



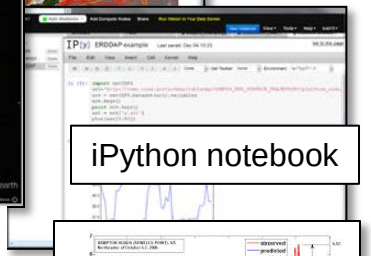
Real time



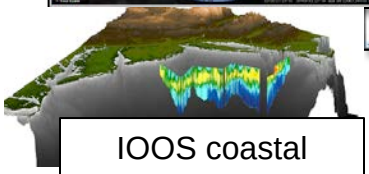
REST services via OSMC/ERDDAP

Live Access Server

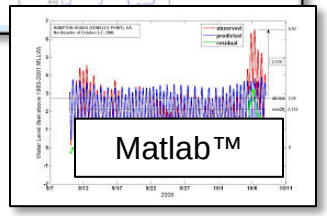
Google Earth



iPython notebook

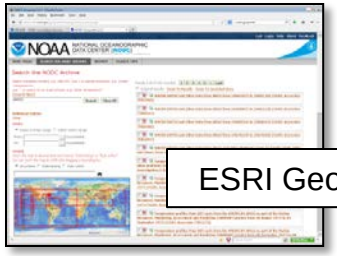


IOOS coastal modeling



Matlab™

Metadata available through international standards



ESRI Geoportal

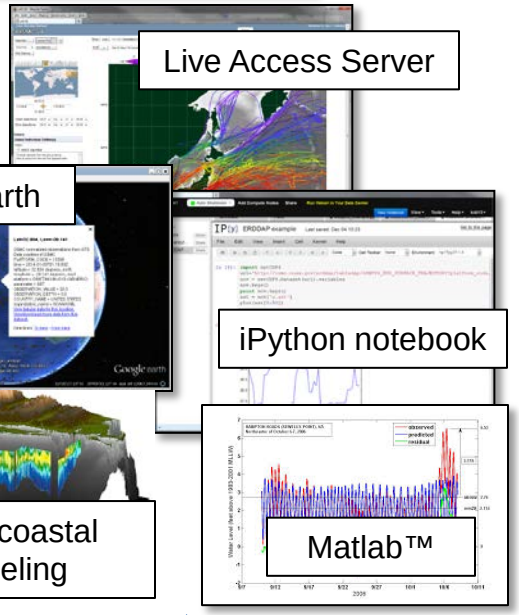
Data flows directly into users' applications

Integration strategies that provides multiple access and discovery services for near real time data can be leveraged for delayed mode data as well

DACs

Delayed mode

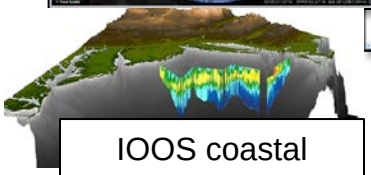
REST services via ERDDAP



Live Access Server

Google Earth

iPython notebook



IOOS coastal modeling

Matlab™

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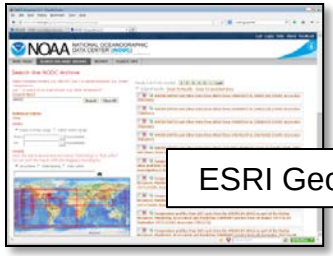


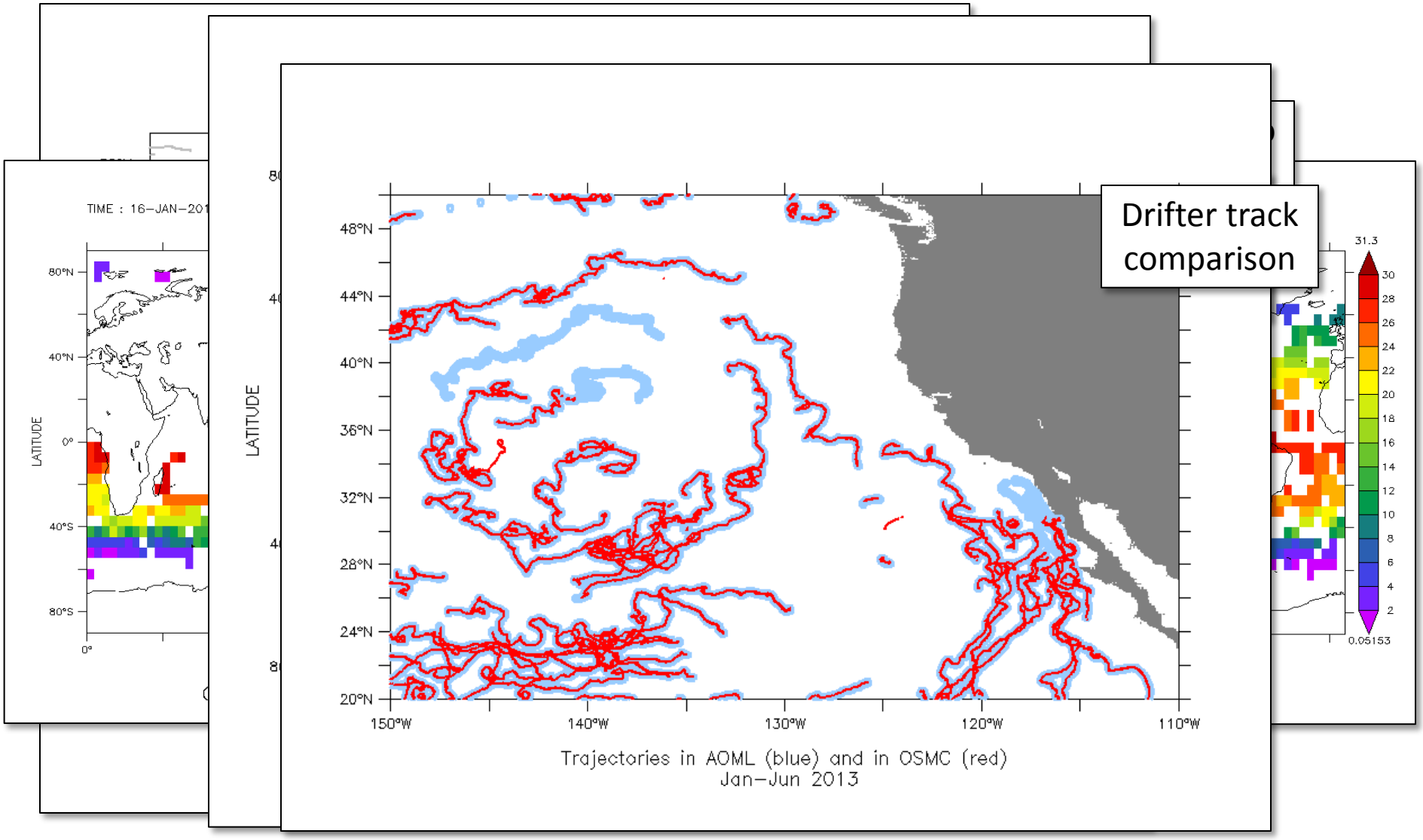
ESRI Geoportal

Data flows directly into users' applications

Integration of delayed-mode data

- Also serve through ERDDAP
  - Provides standard queries to access all data

- Allow easy comparison between NRT and delayed mode data


Drifter track comparison
48°N
44°N
40°N
36°N
32°N
28°N
24°N
20°N
150°W
140°W
130°W
120°W
110°W
LATITUDE
Trajectories in AOML (blue) and in OSMC (red)
Jan–Jun 2013
TIME : 16–JAN–201
80°N
40°N
0°
40°S
80°S
LATITUDE
31.3
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0.05153

Integration of delayed-mode data

- Serve through ERDDAP
  - Provides standard queries to access all data
- Allow comparison between NRT and delayed mode data
- Allow integration of data
- Users can work with parameters, not platforms

GOAL: Investigate “Surface” Temp from the In Situ Ocean observations from 2012. Platforms include:

- Argo
- Drifter
- SOCAT underway
- Gosud underway
- Tropical Moored buoys

Getting the data – current steps

Argo
- Can select region at Coriolis
- Download notification via email
- ftp files
- Argo netCDF format

Drifter
- ftp available from AOML
- Can select region, or just download full regions
- ASCII format, with metadata in separate file

GOSUD
- Available via ftp
- Download all data, no subsetting
- netCDF format

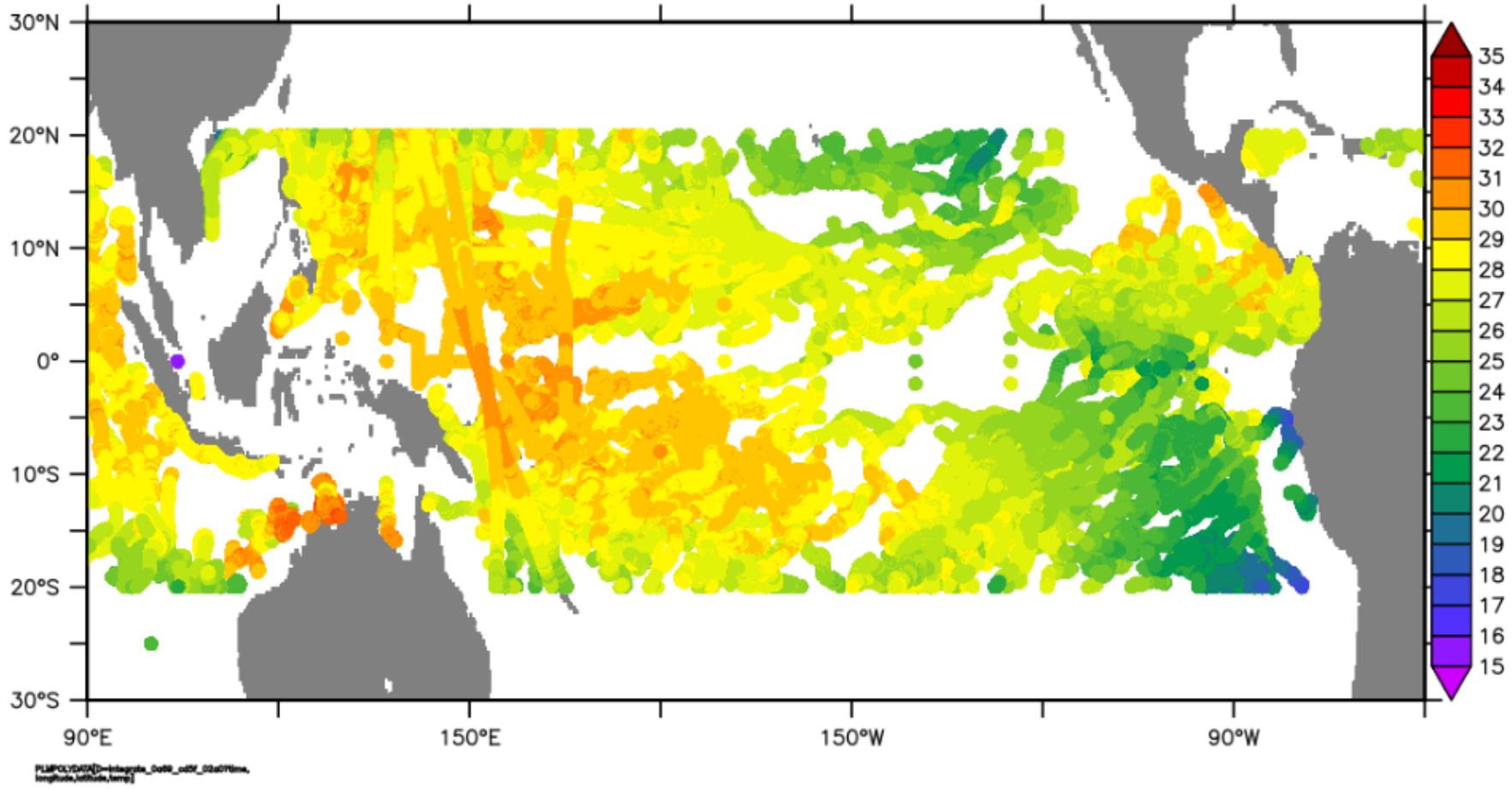
SOCAT data collection
- Available as zip file for whole collection or individual cruise files
- Can download Tropical Pacific
- ASCII data – excel file

Tropical Moored Array data
- Available through PMEL
- Can use UI to select platforms
- Download netCDF data

Getting the data - integrated

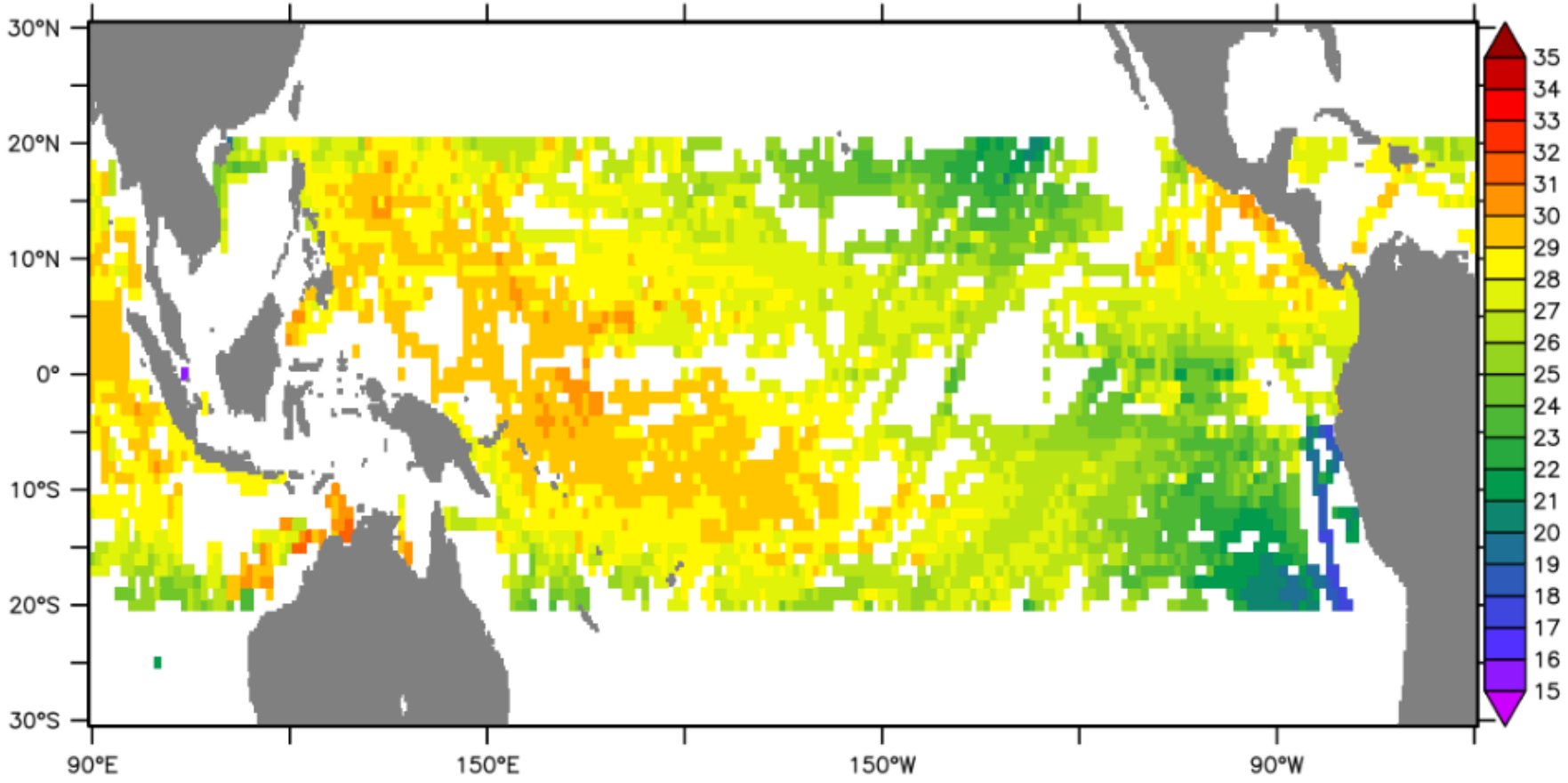
use http://dunkel.pmel.noaa.gov/erddap/tabledap/integrated_SST?time,longitude,latitude,temp

go polymark poly/lev=(-INF)(15,35,1)(INF) 'LONGITUDE' 'LATITUDE' 'TEMP'



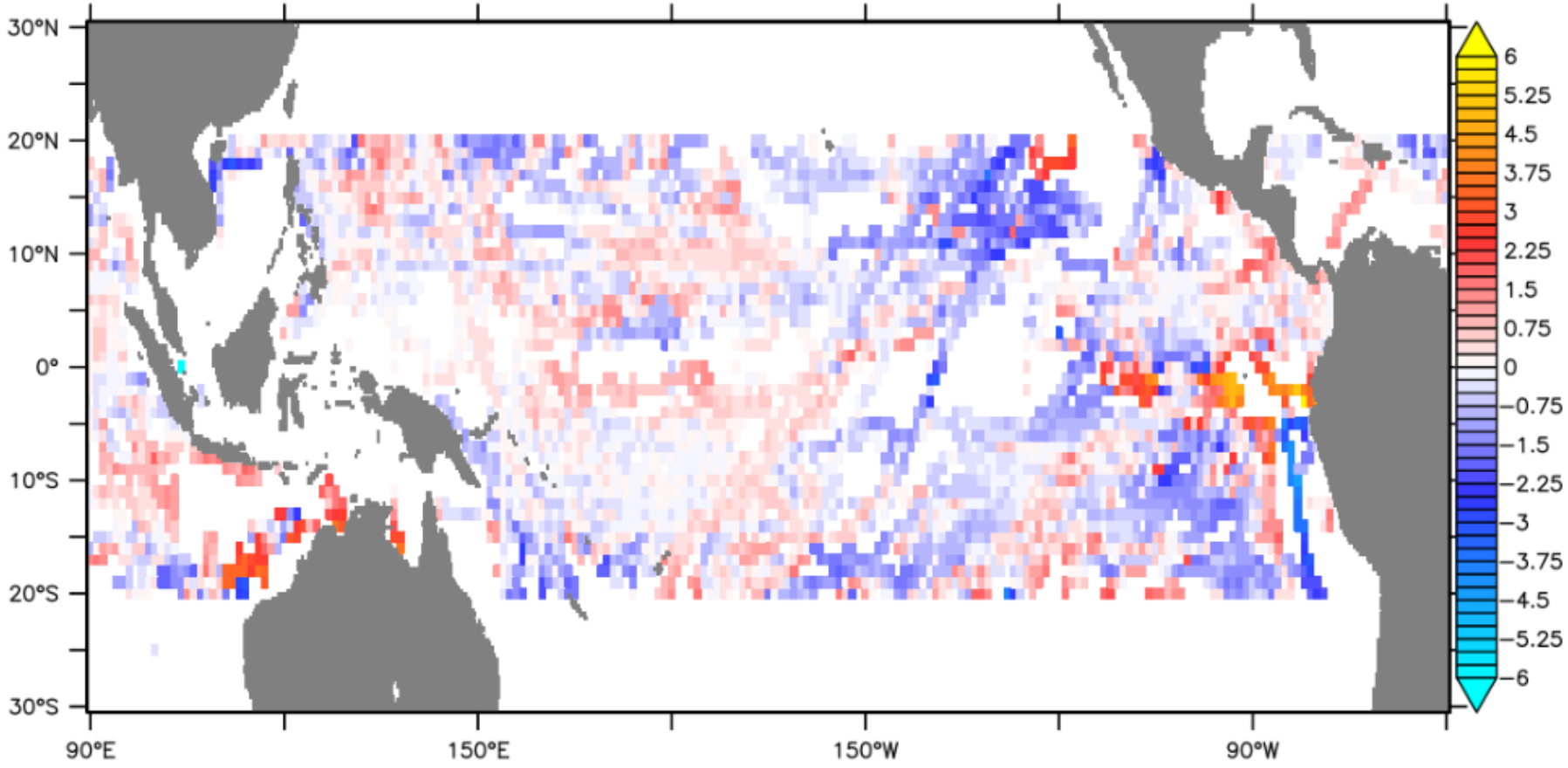
Getting the data - integrated

Regrid to 1x1 degree box



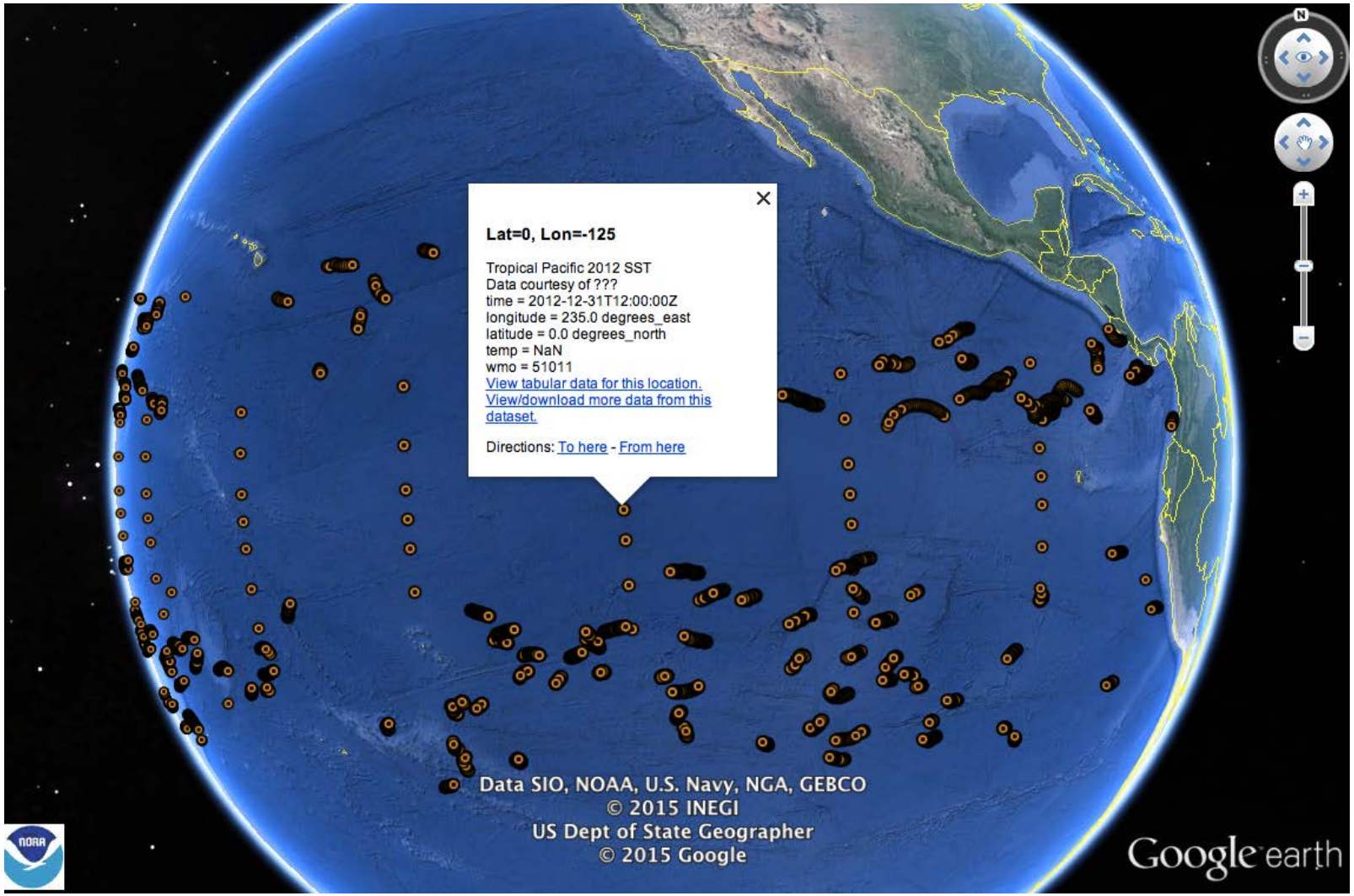
Getting the data - integrated

Can now easily compare with climatological surface temp



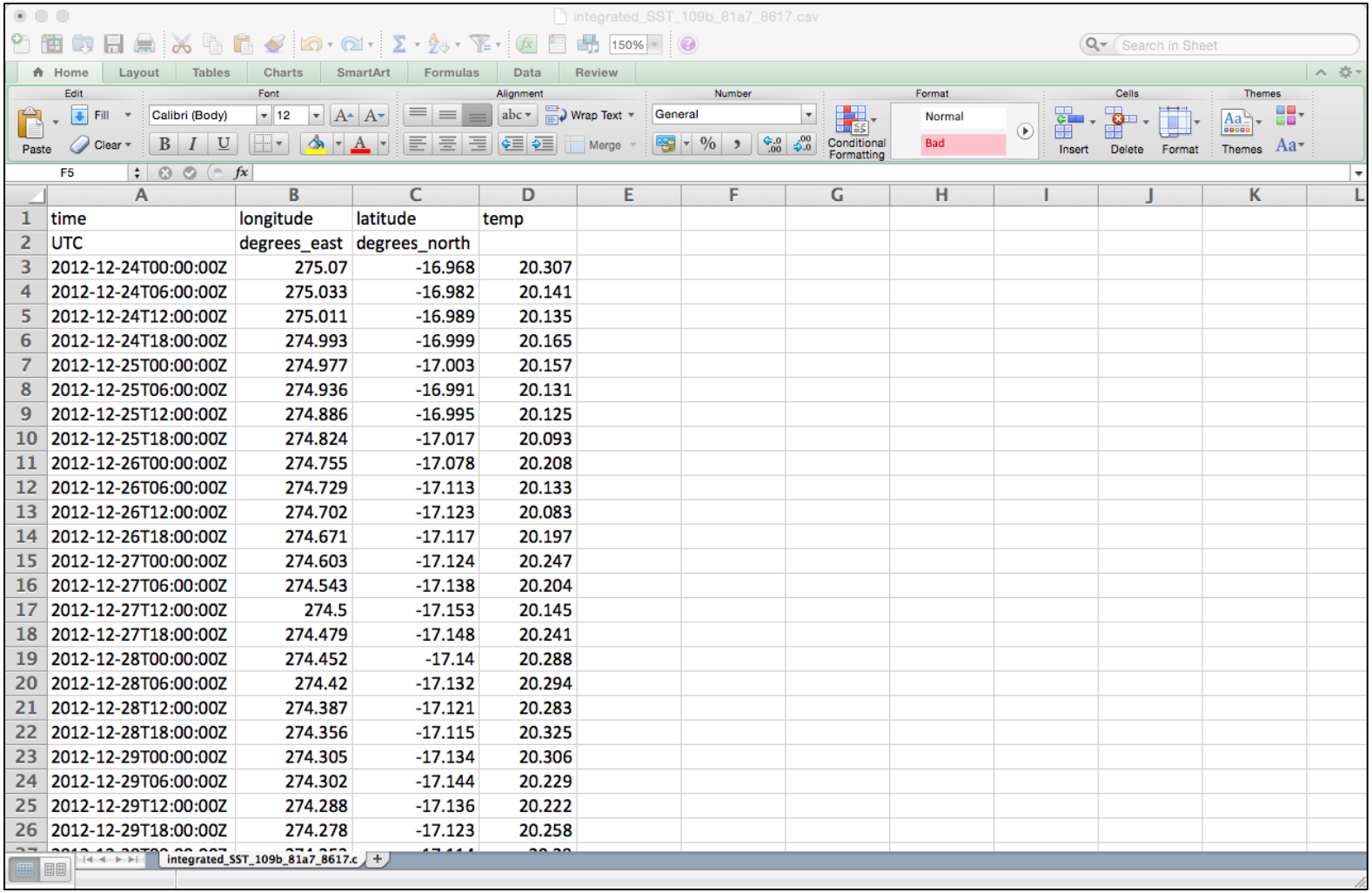
Getting the data - integrated

use http://dunkel.pmel.noaa.gov/erddap/tabledap/integrated_SST.kml?time,longitude,latitude,temp



Getting the data - integrated

use http://dunkel.pmel.noaa.gov/erddap/tabledap/integrated_SST.csv?time,longitude,latitude,temp



	A	B	C	D
1	time	longitude	latitude	temp
2	UTC	degrees_east	degrees_north	
3	2012-12-24T00:00:00Z	275.07	-16.968	20.307
4	2012-12-24T06:00:00Z	275.033	-16.982	20.141
5	2012-12-24T12:00:00Z	275.011	-16.989	20.135
6	2012-12-24T18:00:00Z	274.993	-16.999	20.165
7	2012-12-25T00:00:00Z	274.977	-17.003	20.157
8	2012-12-25T06:00:00Z	274.936	-16.991	20.131
9	2012-12-25T12:00:00Z	274.886	-16.995	20.125
10	2012-12-25T18:00:00Z	274.824	-17.017	20.093
11	2012-12-26T00:00:00Z	274.755	-17.078	20.208
12	2012-12-26T06:00:00Z	274.729	-17.113	20.133
13	2012-12-26T12:00:00Z	274.702	-17.123	20.083
14	2012-12-26T18:00:00Z	274.671	-17.117	20.197
15	2012-12-27T00:00:00Z	274.603	-17.124	20.247
16	2012-12-27T06:00:00Z	274.543	-17.138	20.204
17	2012-12-27T12:00:00Z	274.5	-17.153	20.145
18	2012-12-27T18:00:00Z	274.479	-17.148	20.241
19	2012-12-28T00:00:00Z	274.452	-17.14	20.288
20	2012-12-28T06:00:00Z	274.42	-17.132	20.294
21	2012-12-28T12:00:00Z	274.387	-17.121	20.283
22	2012-12-28T18:00:00Z	274.356	-17.115	20.325
23	2012-12-29T00:00:00Z	274.305	-17.134	20.306
24	2012-12-29T06:00:00Z	274.302	-17.144	20.229
25	2012-12-29T12:00:00Z	274.288	-17.136	20.222
26	2012-12-29T18:00:00Z	274.278	-17.123	20.258

Integration strategies that provides multiple access and discovery services for near real time data can be leveraged for delayed mode data as well

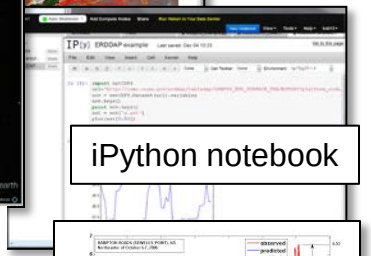
DACs

Delayed mode

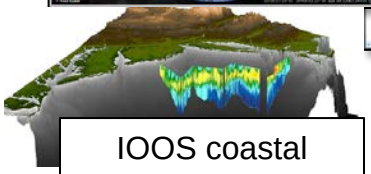
REST services via ERDDAP

Live Access Server

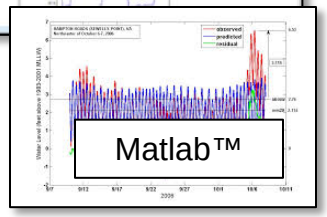
Google Earth



iPython notebook

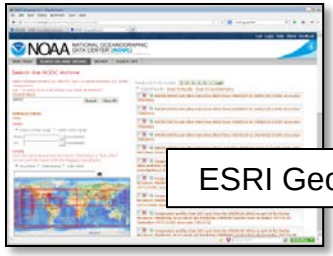


IOOS coastal modeling



Matlab™

Metadata available through international standards



ESRI Geoportal

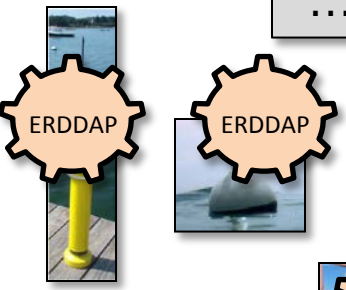
Data flows directly into users' applications

DACs

Integration strategies that provides multiple access and discovery services for near real time data can be leveraged for delayed mode data as well

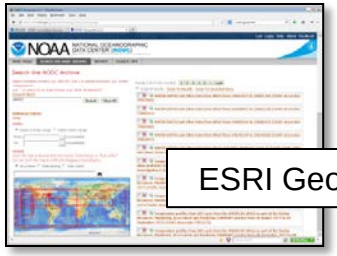
REST services via ERDDAP

…. Or, better yet, here

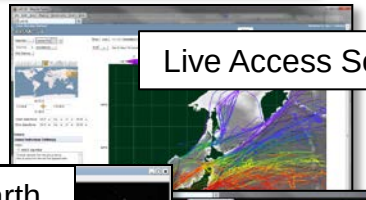


Metadata available

Original metadata can be enhanced at this point, if necessary

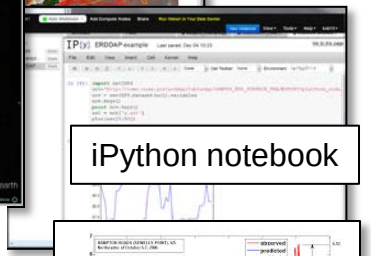


ESRI Geoportal

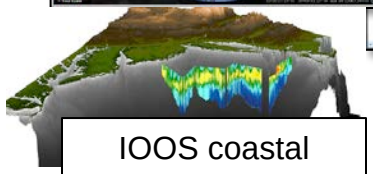


Live Access Server

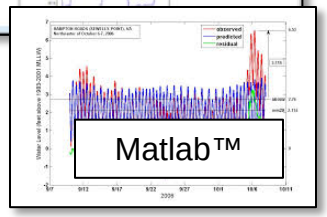
Google Earth



iPython notebook



IOOS coastal modeling



Matlab™

Data flows directly into users' applications

Thank you!

- OSMC: www.osmc.noaa.gov
- OSMC ERDDAP: osmc.noaa.gov/erddap/
- ERDDAP: coastwatch.pfeg.noaa.gov/erddap

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