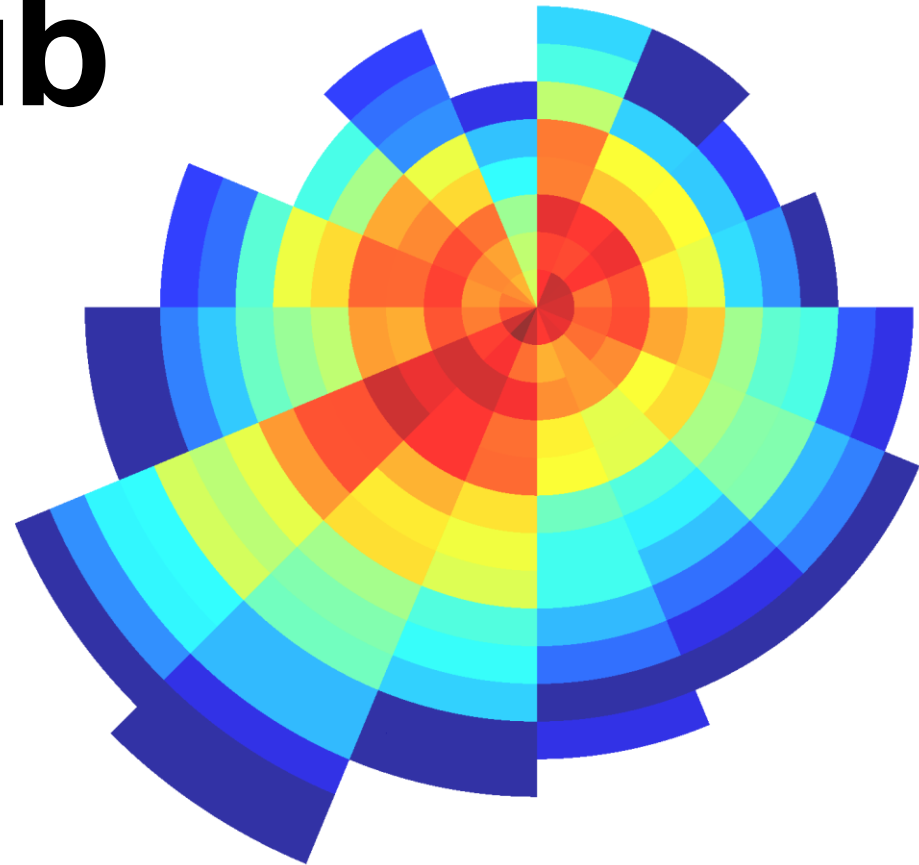
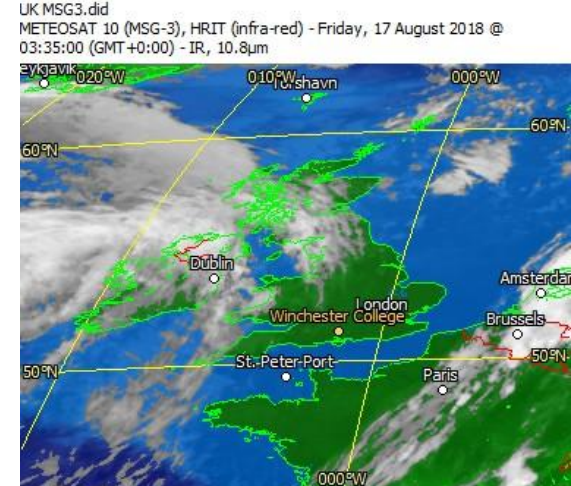
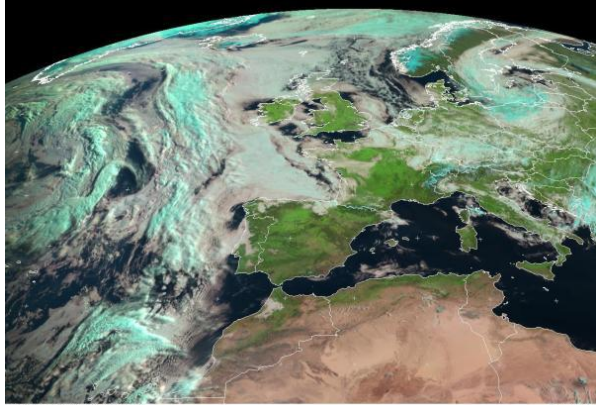


# Winchester College Earth Observation Data Hub

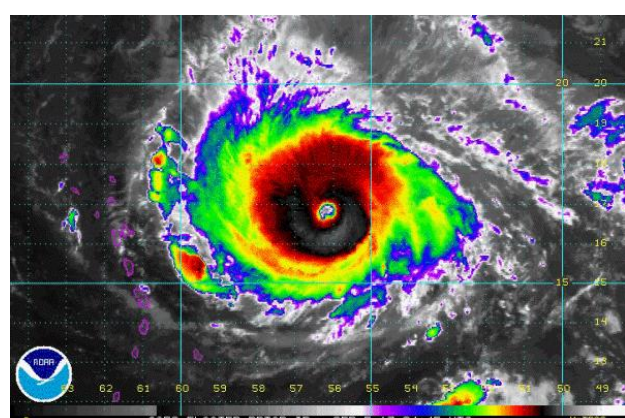
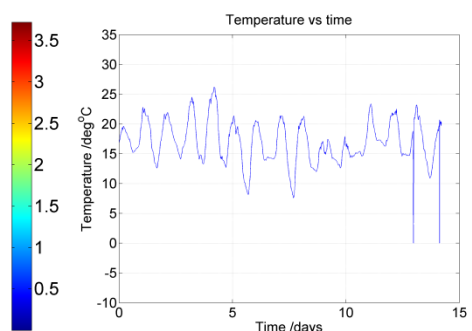
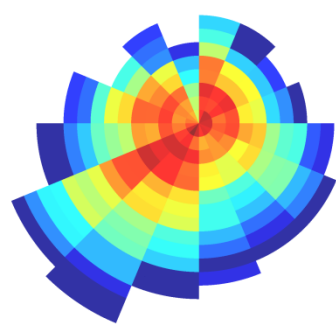


WINCHESTER  
COLLEGE



# The Winchester College Observatory: An Earth Observation Data Hub

Upgrading the existing Astronomical Observatory to incorporate meteorological data, and how this resource might enhance the educational experience at Winchester  
Dr Andrew French. Sept 2018.





The unique historical resource of the College's Treasury, libraries, archives and ancient buildings provide **context and meaning** to history, Div and the other Arts subjects.

Experimental work in the laboratories of Science School, and the technical skills developed in Mill, are a similarly vitally important contextual element of a pupil's education in Physics, Chemistry, Biology and Design Technology.

# HURRICANE STRUCTURE IN THE NORTHERN HEMISPHERE

Outflow cirrus shield

Warm rising air

Outflow

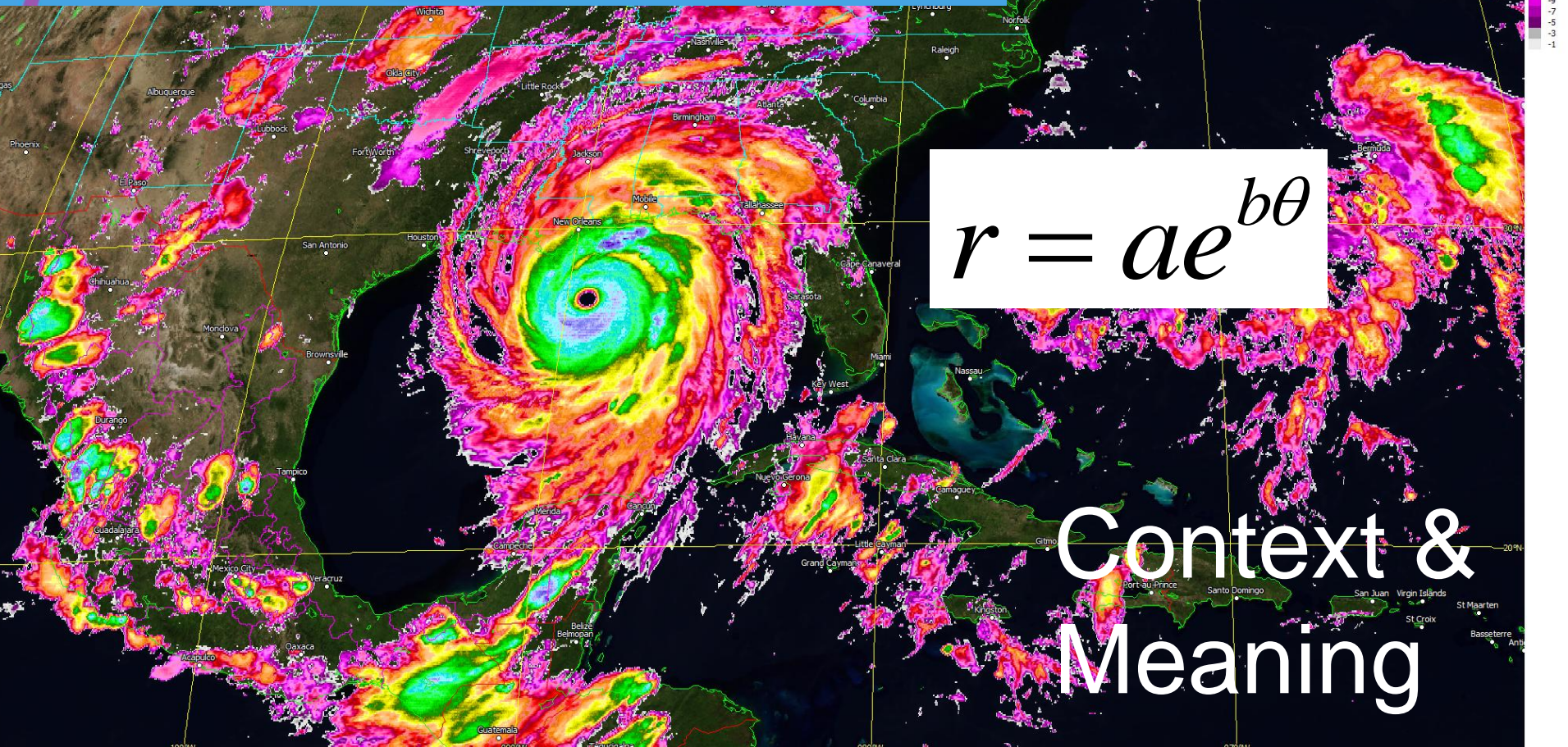
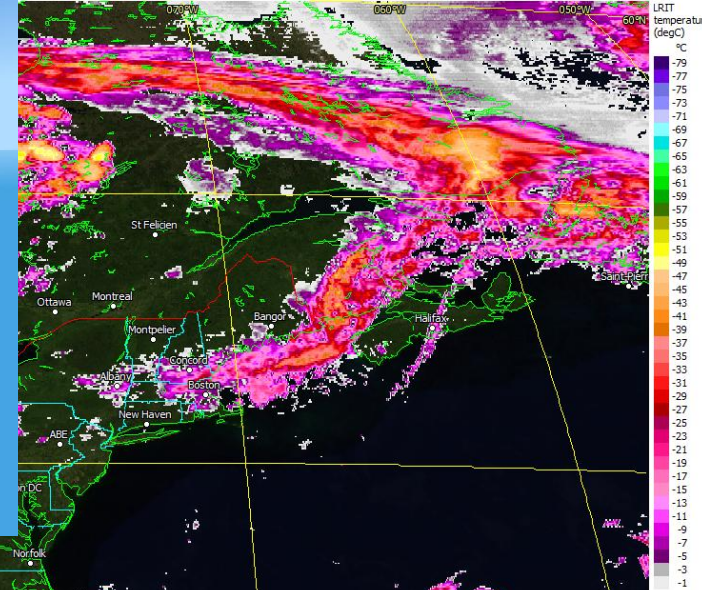
Cold falling air

Eye wall

Eye

Rain bands

Storm rotation  
COUNTERCLOCKWISE



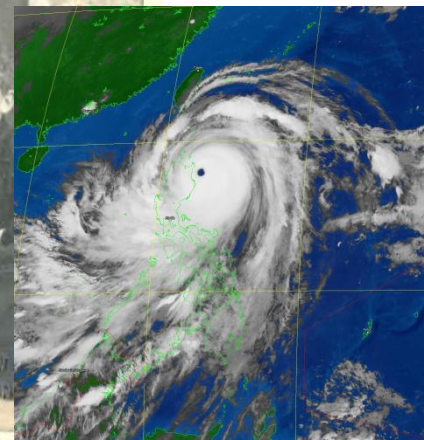
$$r = ae^{b\theta}$$

Context &  
Meaning



College, 1937.

Sir James Lighthill  
1924-1988



Geostationary →



### EUMETCAST Earth Observation data

e.g. full hemisphere  
weather every 15 minutes  
at 1 pixel per km<sup>2</sup> resolution!



Dartcom PC based receiver  
system running software to  
ingest and process each data  
stream simultaneously

Workstation  
console in  
room beneath  
observatory

### Phase 2



**Astronomical  
telescope**  
(+ spectrometer,  
digital camera  
etc)

Star track?

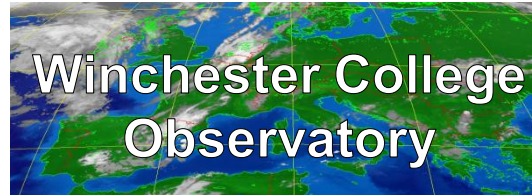
- Temperature
- Pressure
- Humidity
- Solar radiation
- Wind speed
- Wind direction
- UV index



### Davis Vantage Pro automated weather station

**Processed data** (e.g.  
temperature  
variation vs time Excel  
sheet, indexed images  
for plotting cloud cover  
over UK vs time etc)

USB sticks/hard drives  
(possibly internal network)  
to Z drive / Firefly for  
general Wincoll access



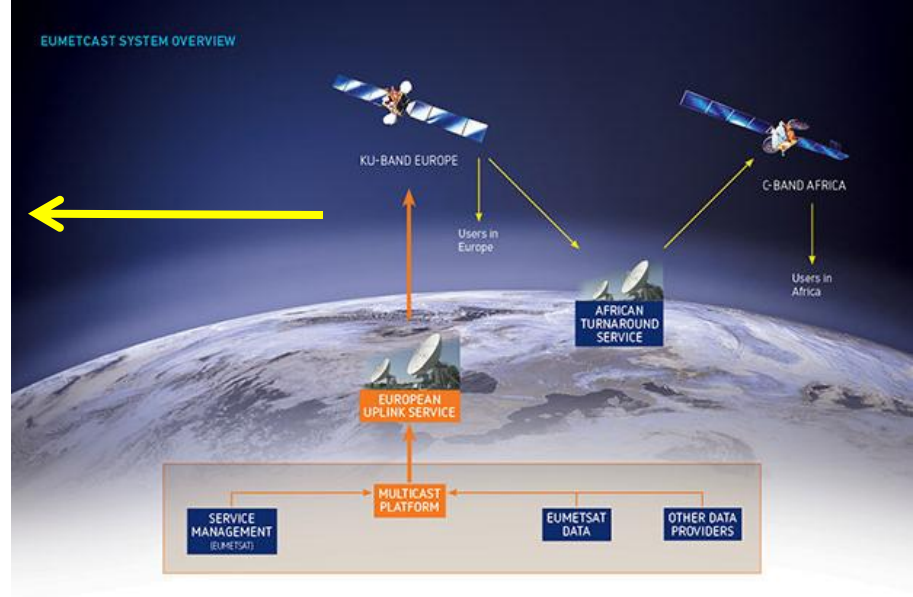
# Automatic ingest of Satellite data

The image displays two software windows on a desktop environment. The background is a satellite map of the Atlantic Ocean region, showing Madeira, Rabat, and Casablanca.

**Dartcom XRIT Ingester** (left window):  
- **Control:** Start, Stop, Pause, Resume, Ingesting.  Start ingesting automatically.  
- **Reception:** Map overlays path: C:\Program Files (x86)\Dartcom\Map overlays.  Store previews in archives.  Output data:  
 -  Raw file  
 -  H-16 data  
 -  XML data  
 -  NetCDF data  
 -  IDAP image  
 -  America GOES 16  
 -  America GOES 16 lo res  
 -  Hurricane GOES 16  
 -  Raw file  
- **Service:** GOES-16, Data type: ABI-L1b, Product: RadF-M3C14, Area: Whole image sub-sampled by 1:2.0, Enhancement: Min-max, Path: (default), File name: America GOES.16.did  
- **Status:** Reception: Not running. File acquisition: Looking for new files. Table:  
 - File type: BUFR data (0), GRIB data (0), HDF5 data (0), NetCDF data (742).  
- **Output:** Awaiting next file. Latest data: RadF-M3C04 to RadF-M3C15. Service: GOES ABI L1b, GOES-16. Type: NetCDF data, ABI-L1b. Product: RadF-M3C14 (11.2um). Date: Thu, Aug 16, 2018. Time: 11:15:49 (GMT).  Show overlay.  
- **Map:** A satellite image of Earth with a green overlay.

**WeatherLink 6.0.3 16/08/18 11:39: Wincoll - [Plot]** (right window):  
- **Week:** Thu, Fri, Sat, Sun, Mon, Tue, Wed. Thu 9 Aug 2018.  
- **Left Y-axis:** Rain Rate - mm/hr (0.0 to 160.0).  
- **Right Y-axis:** Barometer - mb (1008.0 to 1028.0).  
- **Plot:** A combined bar and line chart. Blue bars represent Rain. Multiple lines represent temperature (red, yellow, grey), humidity (black), and other weather variables. A legend at the bottom identifies the series.  
- **Legend:**  
 - Outside Temp (red line), Hi Temp (yellow line), Low Temp (grey line), Out Humidity (black line), Dewpoint (pink line), Wind Speed (blue line), Wind Run (grey line), Hi Wind Speed (yellow line), Hi Wind Dir (grey line), Wind Chill (black line), Heat Index (pink line), THW Index (blue line), THSW Index (grey line), Barometer (grey line), Rain (blue bars), Rain Rate (dark blue line), Solar Rad (yellow line), Solar Energy (grey line), Hi Solar Rad (pink line), UV Index (grey line).

# Automatic ingest of local weather data



↓  
Dartcom receiver system



Name: Europe Africa MSG1  
 Service: MSG1 Data type: MSG1\_IODC

Planes:  
 Single plane (greyscale)  
 Multi-plane (false colour)

Master Product:  
 IR\_108

Area:  
 Whole image  
 Selected area:  
 Left: 0 Top: 0  
 Width: 0 Height: 0

Sub-sample: by factor  
 1:1  
 Width: 3712 Height: 3712

Options:  
 Enhancement: Min-max Map overlays...

Save:  
 Path:  Use default: D:\Dartcom\Images  
 D:\Dartcom\Images

File name:  
 Build automatically:  
 Channel  Data type  Date and time  
 Service  Products  
 Use output name

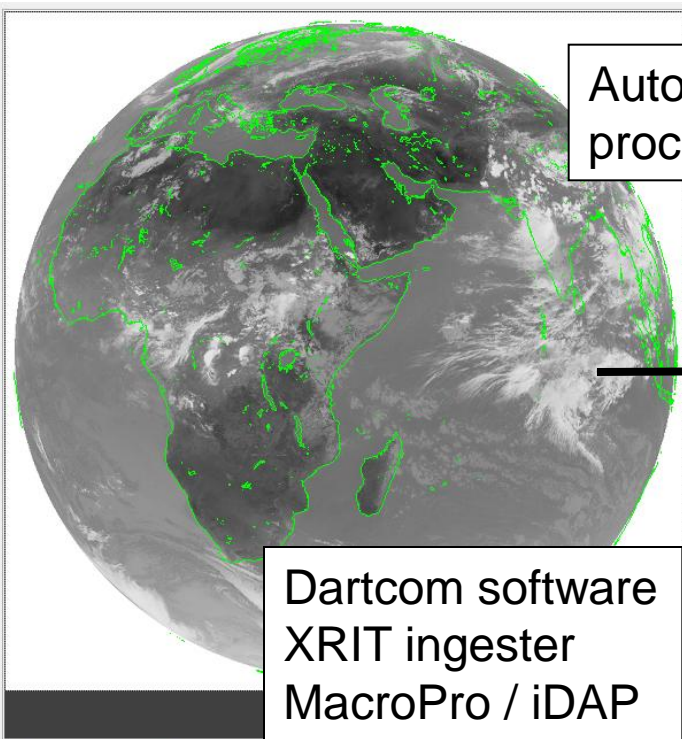
Archive  
 Use default settings  
 Use custom settings:  
 Path: D:\Dartcom\Images\Archive

Delete files over 3 days old

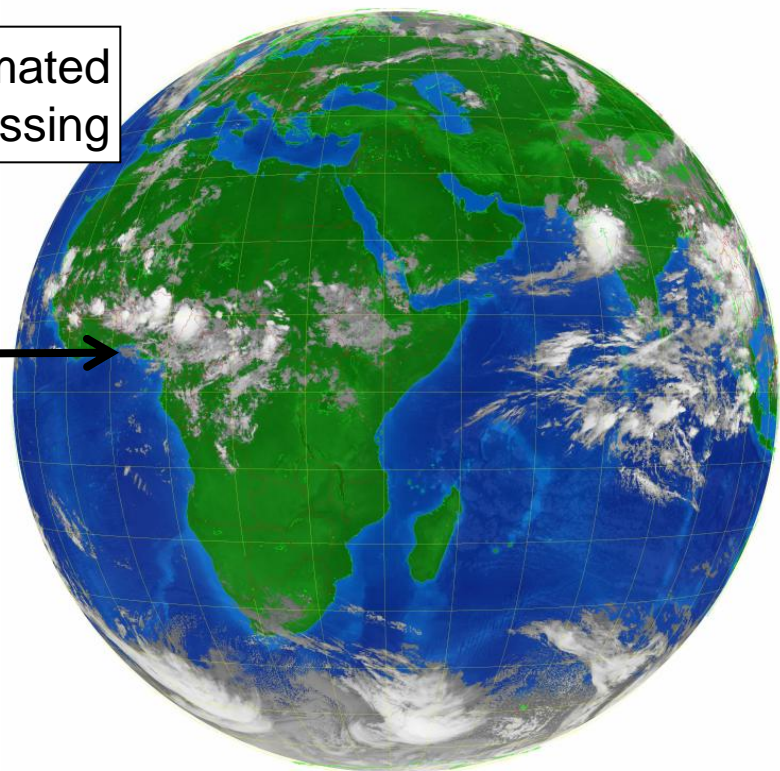
Fit preview to view  Show overlay

Latitude: 10.61°N, Longitude: 024.29°E

Cancel OK



Automated processing



Dartcom software  
 XRIT ingester  
 MacroPro / iDAP



Met & Astro observatory > PROJECTS > 03 2018 Initial data collection > Sat data sample > Europe & Africa - MSG > 2018-08-17

File Edit View Tools Help

Organize Include in library Share with Slide show Burn New folder



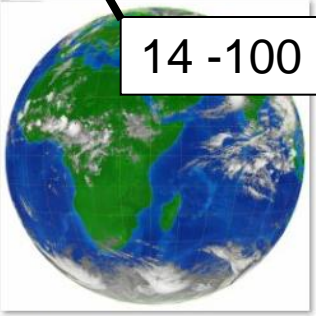
Europe Africa MSG1 [00-00]



Europe Africa MSG1 [00-15]



Europe Africa MSG1 [00-30]



Europe Africa MSG1 [00-45]

14 -100 day archive



Europe Africa MSG1 [01-00]



Europe Africa MSG1 [01-15]



Europe Africa MSG1 [01-30]



Europe Africa MSG1 [01-45]

Automatically ingest and process indexed images (for MSG1 data, every 15 minutes!)



Europe Africa MSG1 [02-00]



Europe Africa MSG1 [02-15]



Europe Africa MSG1 [02-30]

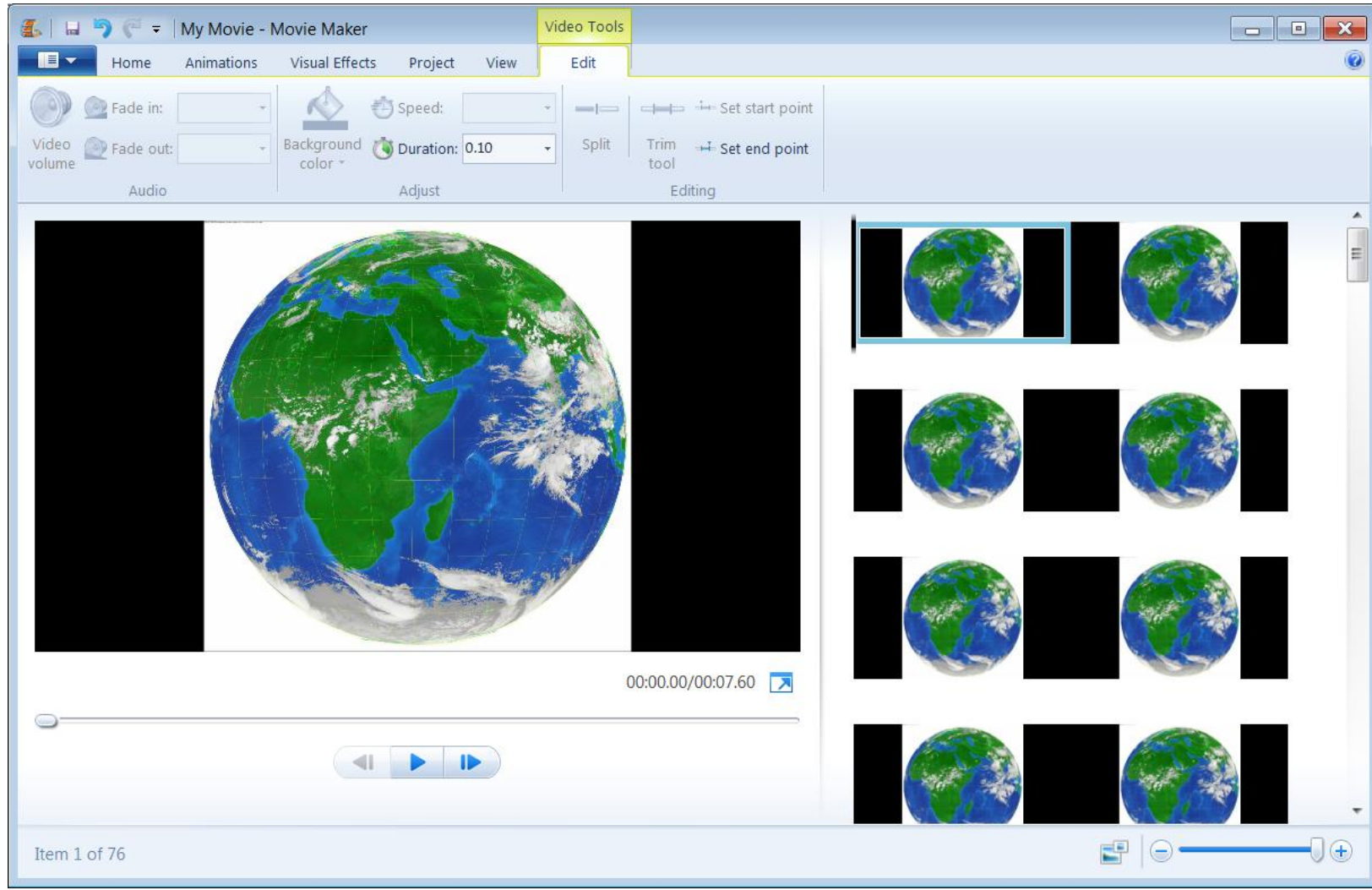


Europe Africa MSG1 [02-45]



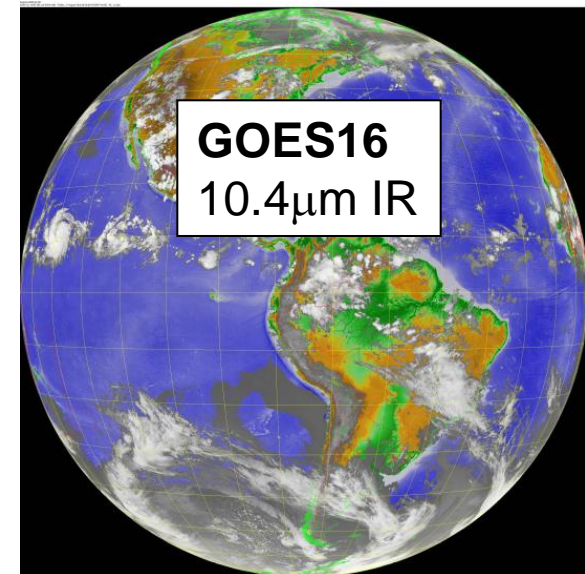
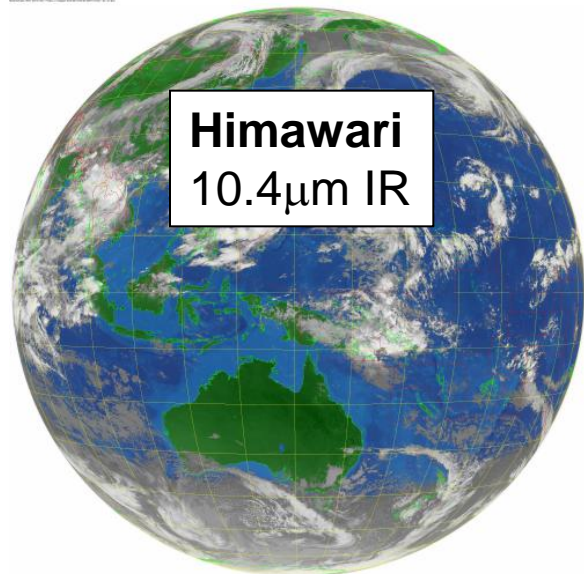
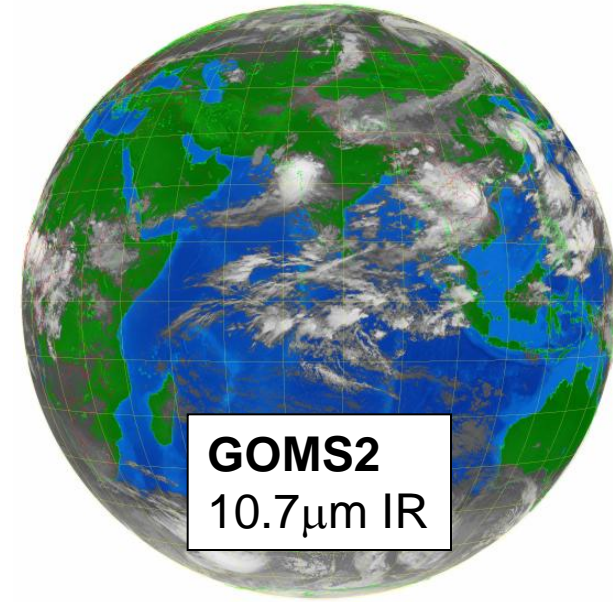
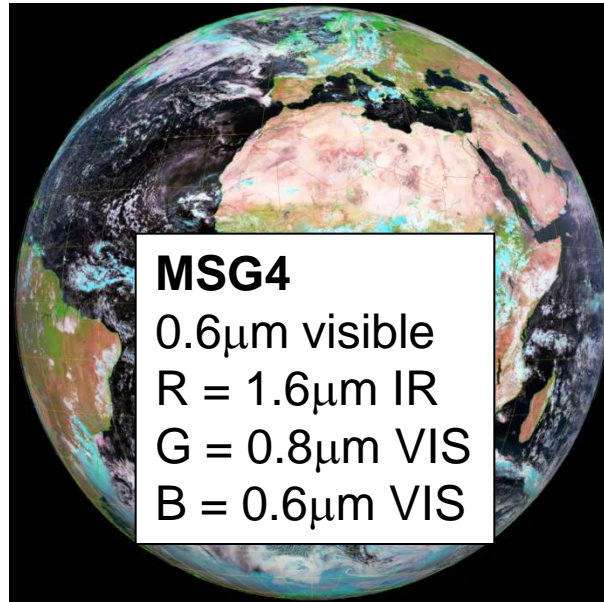
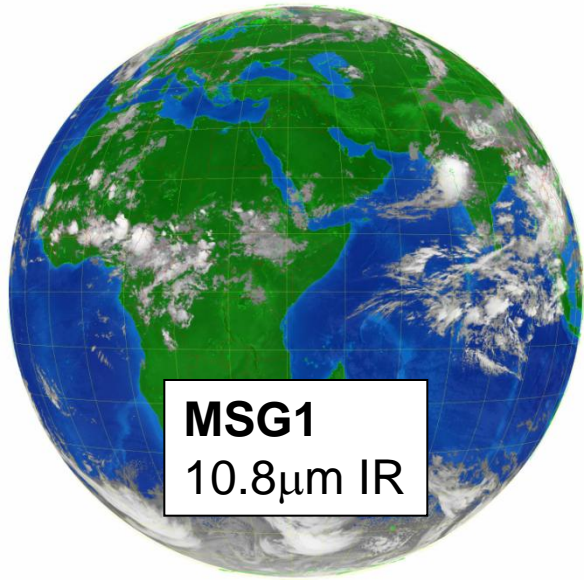
28 items

Since Earth observation satellites are *geostationary*, each image is for the same view of the Earth. Hence it is easy to create **animations** of weather...



[Example movie \(MSG1 Europe & Africa, 10.8 \$\mu\$ m infra red\)](#)

# Initial satellite data collection



# Selected areas

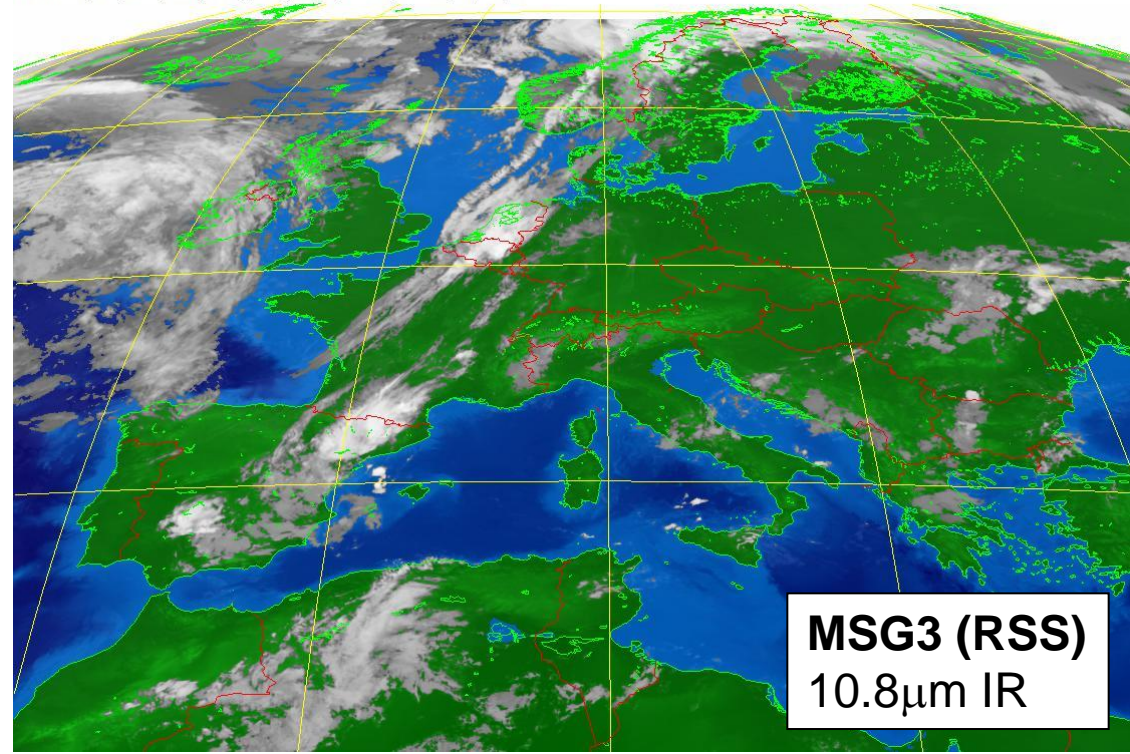
UK MSG3.did  
METEOSAT 10 (MSG-3), HRIT (infra-red) - Friday, 17 August 2018 @  
00:15:00 (GMT+0:00) - IR, 10.8μm



**MSG3 (RSS)**  
10.8μm IR

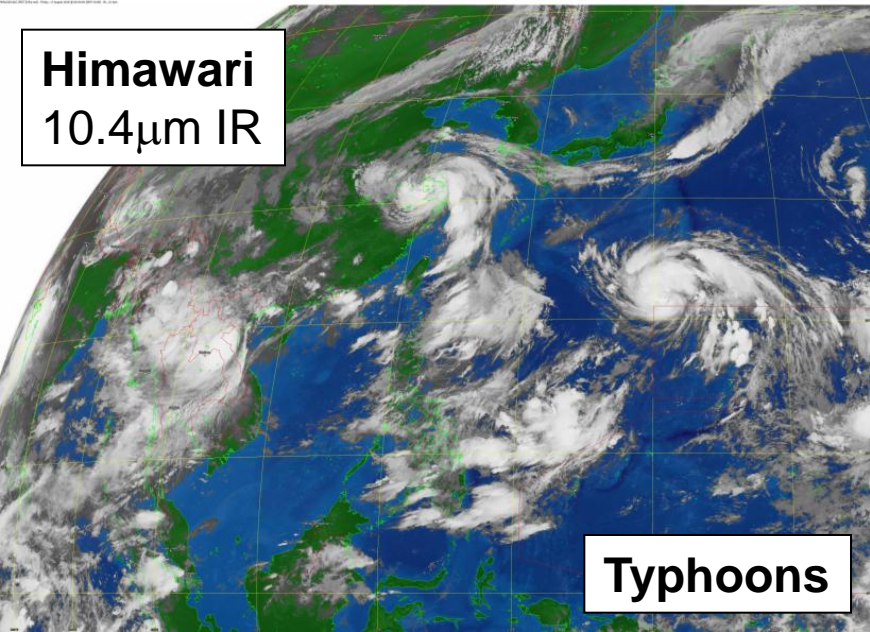
**Local**

Europe MSG3.did  
METEOSAT 10 (MSG-3), HRIT (infra-red) - Friday, 17 August 2018 @ 01:00:00 (GMT+0:00) - IR, 10.8μm



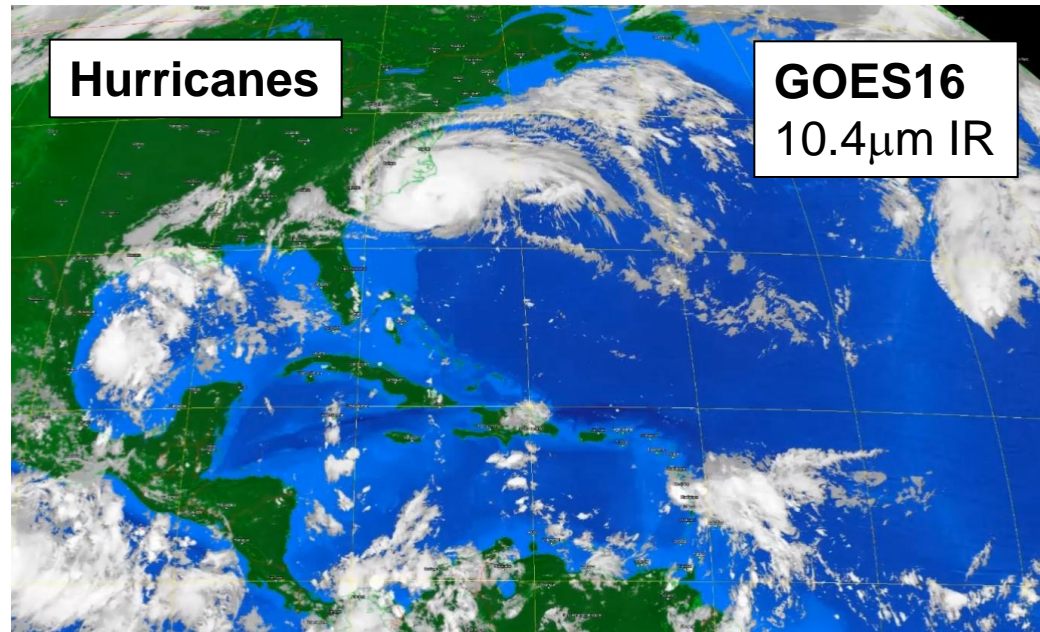
**MSG3 (RSS)**  
10.8μm IR

**Himawari**  
10.4μm IR

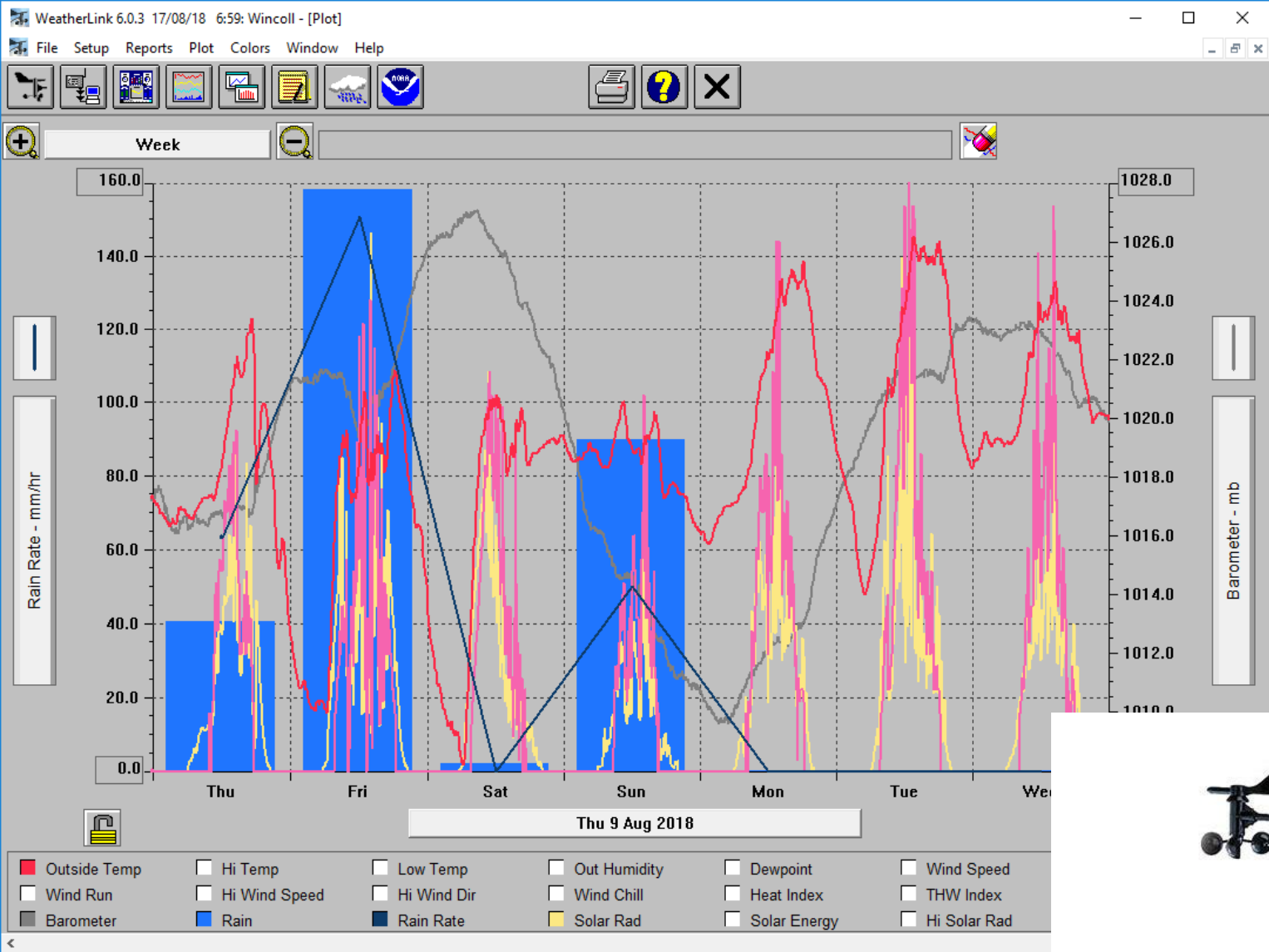


**Typhoons**

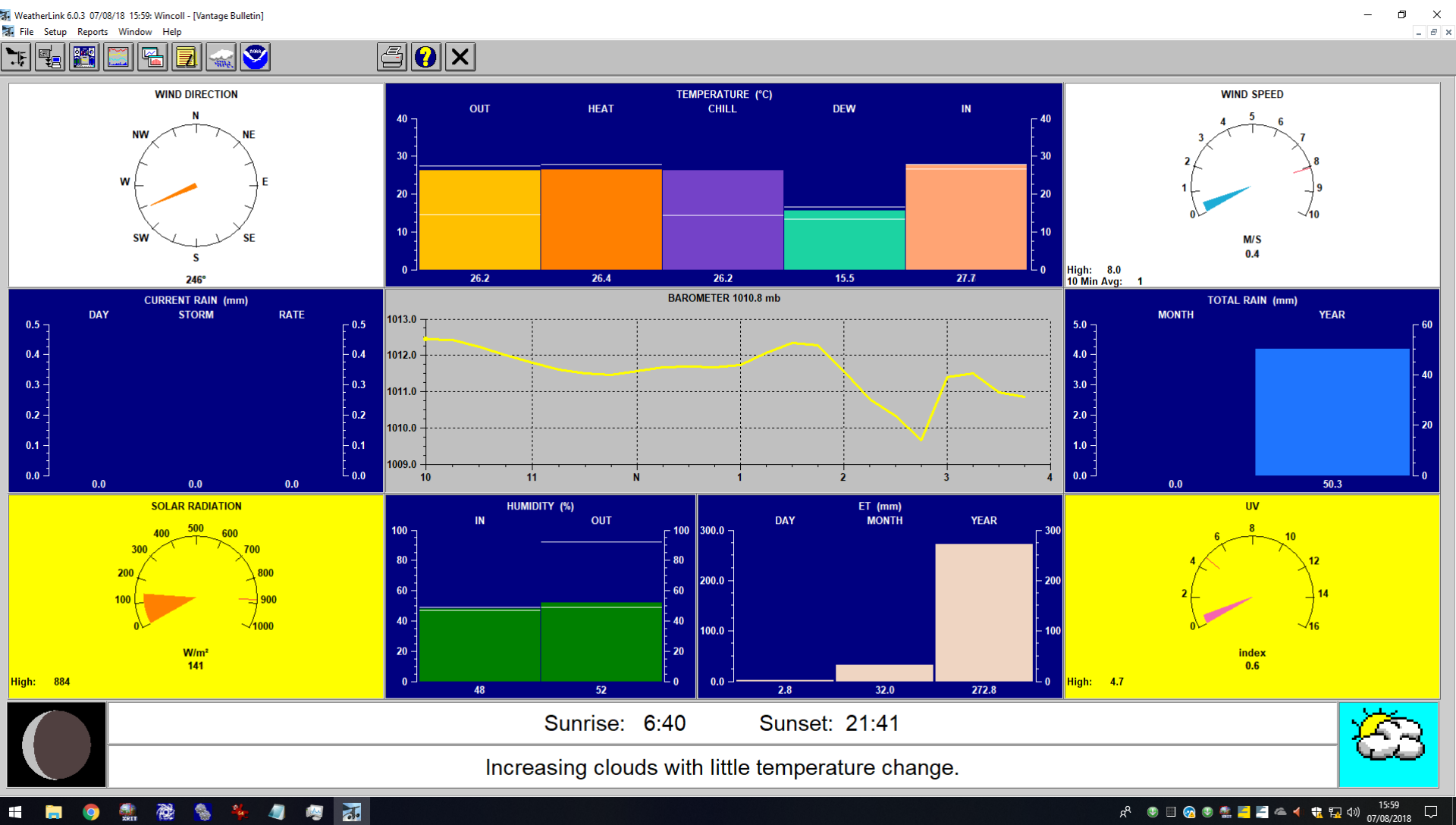
**Hurricanes**



**GOES16**  
10.4μm IR



Davis Vantage Pro Weather Station  
+ WeatherLink software



Colour version of the console display (mounted to the wall next opposite the Physics prep room)



TextPad - [E:\Reference\Physics\12 Inspiratia\Met & Astro observatory\PROJECTS\03 2018 Initial data collection\Weather station\Weatherlink 21-6-18.txt]

File Edit Search View Tools Macros Configure Window Help

Weatherlink 21-6-18.txt

1	Temp	Hi	Low	Out	Dew	Wind	Wind		
2	Date	Time	Out	Temp	Temp	Hum	Pt.	Speed	Dir
3	07/06/18	12:30	16.8	17.1	16.8	72	11.8	1.8	E
4	07/06/18	13:00	17.3	17.5	16.8	70	11.8	1.3	ENE
5	07/06/18	13:30	17.4	17.4	16.9	70	11.9	1.3	E
6	07/06/18	14:00	18.1	18.1	17.4	69	12.3	1.3	NE
7	07/06/18	14:30	18.5	18.5	18.1	69	12.7	0.9	NE
8	07/06/18	15:00	18.6	18.7	18.5	70	13.0	0.9	NNE
9	07/06/18	15:30	19.3	19.4	18.7	67	13.0	0.9	ESE
10	07/06/18	16:00	19.4	19.4	19.3	67	13.1	1.3	E
11	07/06/18	16:30	19.0	19.6	19.0	69	13.2	1.3	ESE
12	07/06/18	17:00	19.6	19.6	19.0	68	13.5	1.3	ESE
13	07/06/18	17:30	19.6	19.7	19.4	68	13.5	0.9	ESE
14	07/06/18	18:00	19.3	19.6	19.3	70	13.7	0.9	E
15	07/06/18	18:30	19.2	19.3	19.1	71	13.8	0.9	NE
16	07/06/18	19:00	19.1	19.1	19.0	74	14.3	0.0	NE
17	07/06/18	19:30	18.7	19.1	18.7	75	14.1	0.0	ESE
18	07/06/18	20:00	18.6	18.7	18.5	75	14.0	0.0	N
19	07/06/18	20:30	18.5	18.6	18.5	77	14.4	0.0	N
20	07/06/18	21:00	18.3	18.5	18.3	77	14.2	0.0	NNE
21	07/06/18	21:30	18.0	18.3	17.9	79	14.3	0.0	N
22	07/06/18	22:00	17.8	18.0	17.8	79	14.1	0.0	NNE
23	07/06/18	22:30	17.6	17.9	17.6	81	14.3	0.0	---
24	07/06/18	23:00	17.4	17.7	17.3	82	14.3	0.0	---
25	07/06/18	23:30	17.5	17.5	17.3	81	14.2	0.4	N
26	08/06/18	00:00	17.2	17.5	17.2	81	13.9	0.4	NE
27	08/06/18	0:30	16.8	17.2	16.8	83	13.9	0.0	ENE
28	08/06/18	1:00	16.3	16.8	16.3	85	13.8	0.4	SE
29	08/06/18	1:30	15.9	16.3	15.9	86	13.6	0.0	---
30	08/06/18	2:00	15.7	15.9	15.7	87	13.6	0.0	---
31	08/06/18	2:30	15.6	15.8	15.6	88	13.6	0.0	---
32	08/06/18	3:00	15.2	15.6	15.2	90	13.6	0.0	---
33	08/06/18	3:30	15.2	15.2	15.2	90	13.6	0.0	WSW

ANSI Characters

33 !  
34 "  
35 #  
36 \$  
37 %  
38 &  
39 '  
40 (  
41 )  
42 \*  
43 +  
44 .  
45 .  
46 .  
47 /  
48 0  
49 1  
50 2  
51 3  
52 4  
53 5  
54 6  
55 7  
56 8

1 1 Read Ovr Block Sync Rec Caps

Text file data exported from Weatherlink



Browse the station data.

Browse Records

Date	Time	Temp Out	Hi Temp	Low Temp	Out Hum	Dew Pt.	Wind Speed	Wind Dir	Wind Run	Hi Speed	Hi Dir	Wind Chill	Heat Index	THW Index	THSW Index	Bar	Rain	Rain Rate	Solar Rad.	Solar Energy	Hi Solar Rad.	UV Index	UV Dose	Hi UV	Heat D-D	Cool D-D	In Temp	In Hum	In Dew	In Heat	In EMC	In Air Density	Temp 2nc
7/08/18	16:21	26.2	26.2	26.2	51	15.3	2.2	SW	0.13	3.1	SSW	26.2	26.4	26.4	28.7	1010.5	0.00	0.0	320	0.46	320	1.5	0.01	1.5	0.000	0.005	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:22	26.2	26.3	26.2	51	15.3	2.7	SW	0.16	3.6	SSW	26.2	26.4	26.4	29.3	1010.5	0.00	0.0	360	0.52	360	1.6	0.01	1.6	0.000	0.005	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:23	26.2	26.2	26.2	51	15.3	2.2	SSW	0.13	4.0	SW	26.2	26.4	26.4	29.3	1010.5	0.00	0.0	360	0.52	360	1.7	0.01	1.7	0.000	0.005	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:24	26.2	26.3	26.2	52	15.6	2.2	SW	0.13	2.7	S	26.2	26.4	26.4	29.4	1010.5	0.00	0.0	360	0.52	360	1.6	0.01	1.6	0.000	0.005	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:25	26.3	26.3	26.2	51	15.3	2.2	SW	0.13	3.1	SSW	26.3	26.4	26.4	29.3	1010.4	0.00	0.0	360	0.52	360	1.8	0.01	1.8	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1496	---
7/08/18	16:26	26.3	26.3	26.2	51	15.3	1.3	SSW	0.08	2.2	SSW	26.3	26.4	26.4	31.2	1010.5	0.00	0.0	519	0.74	519	1.7	0.01	1.7	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:27	26.3	26.3	26.3	52	15.7	0.4	S	0.03	0.9	WSW	26.3	26.6	26.6	28.7	1010.5	0.00	0.0	295	0.42	295	1.5	0.01	1.5	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:28	26.4	26.4	26.3	52	15.7	1.3	SW	0.08	1.8	WNW	26.4	26.6	26.6	28.5	1010.6	0.00	0.0	285	0.41	285	1.4	0.01	1.4	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1498	---
7/08/18	16:29	26.4	26.4	26.3	51	15.4	0.9	S	0.05	1.3	S	26.4	26.6	26.6	28.1	1010.5	0.00	0.0	246	0.35	246	1.3	0.01	1.3	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:30	26.4	26.4	26.4	51	15.5	0.9	SSW	0.05	1.3	SW	26.4	26.6	26.6	27.9	1010.5	0.00	0.0	232	0.33	232	1.2	0.01	1.2	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1497	---



To export data from Weatherlink, firstly navigate to **Browse the station data**



Choose Date... Ctrl+D  
 Make a Note... Ctrl+N  
 Edit... Enter  
 Delete Del  
 Copy Records...  
 Export Records...  
 Delete Records...  
 Export Records (GLOBE Format)...  
 Recalculate Daily Values  
 Recalculate THSW Index...

Date	Time	Wind Speed	Wind Dir	Wind Run	Hi Speed	Hi Dir	Wind Chill	Heat Index	THW Index	THSW Index	Bar	Rain	Rain Rate	Solar Rad.	Solar Energy	Hi Solar Rad.	UV Index	UV Dose	Hi UV	Heat D-D	Cool D-D	In Temp	In Hum	In Dew	In Heat	In EMC	In Air Density	Temp 2nc
7/08/18	16:00	2.2	SW	0.13	3.1	SSW	26.2	26.4	26.4	28.7	1010.5	0.00	0.0	320	0.46	320	1.5	0.01	1.5	0.000	0.005	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:05	2.7	SW	0.16	3.6	SSW	26.2	26.4	26.4	29.3	1010.5	0.00	0.0	360	0.52	360	1.6	0.01	1.6	0.000	0.005	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:10	2.2	SSW	0.13	4.0	SW	26.2	26.4	26.4	29.3	1010.5	0.00	0.0	360	0.52	360	1.7	0.01	1.7	0.000	0.005	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:15	2.2	SW	0.13	2.7	S	26.2	26.4	26.4	29.4	1010.5	0.00	0.0	360	0.52	360	1.6	0.01	1.6	0.000	0.005	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:20	2.2	SW	0.13	3.1	SSW	26.3	26.4	26.4	29.3	1010.4	0.00	0.0	360	0.52	360	1.8	0.01	1.8	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1496	---
7/08/18	16:25	1.3	SSW	0.08	2.2	SSW	26.3	26.4	26.4	31.2	1010.5	0.00	0.0	519	0.74	519	1.7	0.01	1.7	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:30	0.4	S	0.03	0.9	WSW	26.3	26.6	26.6	28.7	1010.5	0.00	0.0	295	0.42	295	1.5	0.01	1.5	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:35	1.3	SW	0.08	1.8	WNW	26.4	26.6	26.6	28.5	1010.6	0.00	0.0	285	0.41	285	1.4	0.01	1.4	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1498	---
7/08/18	16:40	0.9	S	0.05	1.3	S	26.4	26.6	26.6	28.1	1010.5	0.00	0.0	246	0.35	246	1.3	0.01	1.3	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:45	0.9	SSW	0.05	1.3	SW	26.4	26.6	26.6	27.9	1010.5	0.00	0.0	232	0.33	232	1.2	0.01	1.2	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1497	---



Click on the **Browse** menu item, then **Export Records** ....

WeatherLink 6.0.3 07/08/18 15:54: Wincoll

File Setup Reports Browse Window Help

Date	Time	Temp Out	Hi Temp	Low Temp	Out Hum	Dew Pt.	Wind Speed	Wind Dir	Wind Run	Hi Speed	Hi Dir	Wind Chill	Heat Index	THW Index	THSW Index	Bar	Rain Rate	Solar Rad.	Solar Energy	Hi Solar Rad.	UV Index	UV Dose	Hi UV	Heat D-D	Cool D-D	In Temp	In Hum	In Dew	In Heat	In EMC	In Air Density	Temp 2nc	
7/08/18	16:21	26.2	26.2	26.2	51	15.3	2.2	SW	0.13	3.1	SSW	26.2	26.4	26.4	28.7	1010.5	0.00	0.0	320	0.46	320	1.5	0.01	1.5	0.000	0.005	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:22	26.2	26.3	26.2	51	15.3	2.7	SW	0.16	3.6	SSW	26.2	26.4	26.4	29.3	1010.5	0.00	0.0	360	0.52	360	1.6	0.01	1.6	0.000	0.005	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:23	26.2	26.2	26.2	51	15.3	2.2	SSW	0.13	4.0	SW	26.2	26.4	26.4	29.3	1010.5	0.00	0.0	360	0.52	360	1.7	0.01	1.7	0.000	0.005	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:24	26.2	26.3	26.2	52	15.6	2.2	SW	0.13	2.7	S	26.2	26.4	26.4	29.4	1010.5	0.00	0.0	360	0.52	360	1.6	0.01	1.6	0.000	0.005	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:25	26.3	26.3	26.2	51	15.3	2.2	SW	0.13	3.1	SSW	26.3	26.4	26.4	29.3	1010.4	0.00	0.0	360	0.52	360	1.8	0.01	1.8	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1496	---
7/08/18	16:26	26.3	26.3	26.2	51	15.3	1.3	SSW	0.08	2.2	SSW	26.3	26.4	26.4	31.2	1010.5	0.00	0.0	519	0.74	519	1.7	0.01	1.7	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:27	26.3	26.3	26.3	52	15.7	0.4	S	0.03	0.9	WSW	26.3	26.6	26.6	28.7	1010.5	0.00	0.0	295	0.42	295	1.5	0.01	1.5	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:28	26.4	26.4	26.3	52	15.7	1.3	SW	0.08	1.8	WNW	26.4	26.6	26.6	28.5	1010.6	0.00	0.0	285	0.41	285	1.4	0.01	1.4	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1498	---
7/08/18	16:29	26.4	26.4	26.3	51	15.4	0.9	S	0.05	1.3	S	26.4	26.6	26.6	28.1	1010.5	0.00	0.0	246	0.35	246	1.3	0.01	1.3	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1497	---
7/08/18	16:30	26.4	26.4	26.4	51	15.5	0.9	SSW	0.05	1.3	SW	26.4	26.6	26.6	27.9	1010.5	0.00	0.0	232	0.33	232	1.2	0.01	1.2	0.000	0.006	27.8	48	15.8	27.9	8.81	1.1497	---

Choose days, months, or years to export.

Days... Months... Years...

26/07/18  
27/07/18  
28/07/18  
29/07/18  
30/07/18  
31/07/18  
01/08/18  
02/08/18  
03/08/18  
04/08/18  
05/08/18  
06/08/18  
07/08/18

06-18  
07-18  
08-18

2018

Select Midnight record to export.  
 Use 00:00  Use 24:00

OK Cancel Help

Please specify export file name.

Wincoll > Weather data

Organise New folder

Quick access  
 Desktop  
 Downloads  
 Documents  
 Pictures  
 Data (D:)  
 Images  
 Weather data  
 Weather station

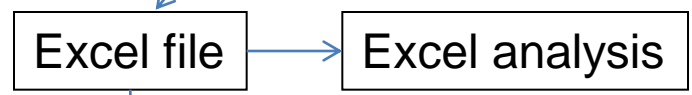
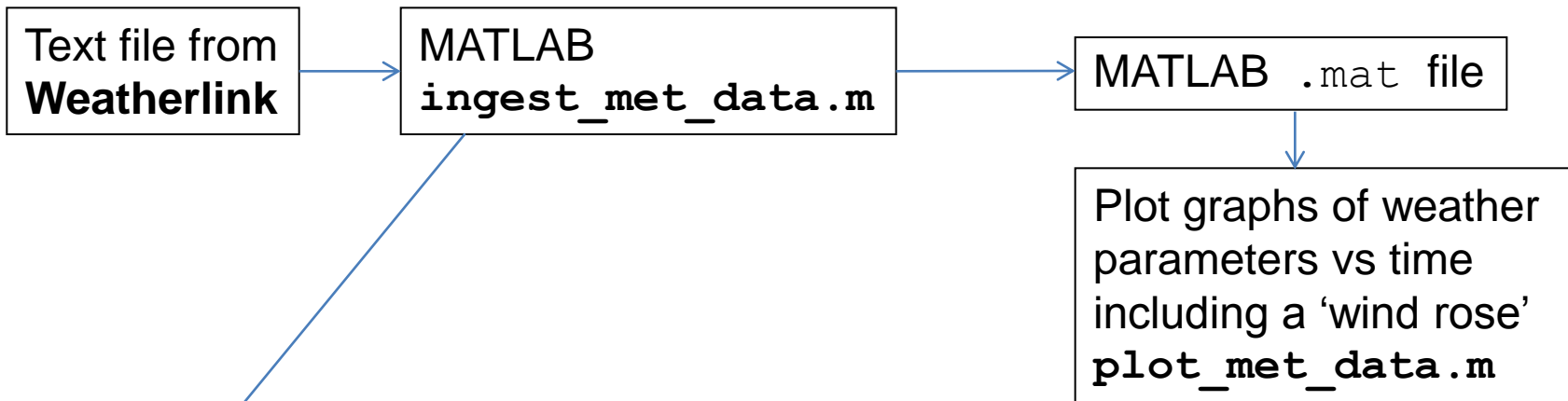
Weatherlink 7-8-18.txt  
 Weatherlink 21-6-18.txt  
 Weatherlink 25-6-18.txt

File name:

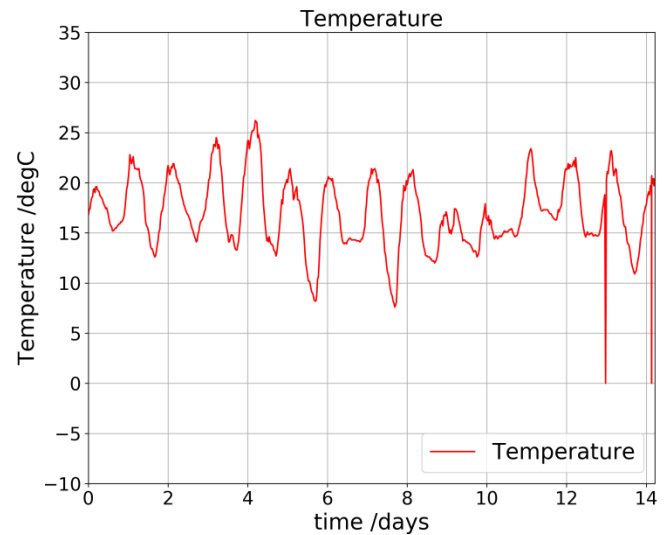
Save as type: Export Files (\*.txt)

Hide Folders Save Cancel

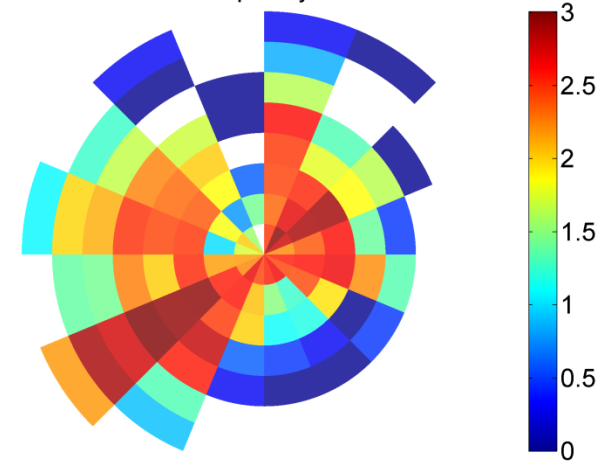
Select the data you want (day, or month, or year(s)....) and save as a text file



Plot graphs of weather parameters vs time using **Python matplotlib.py** (Small numbers of samples i.e. < 10,000)

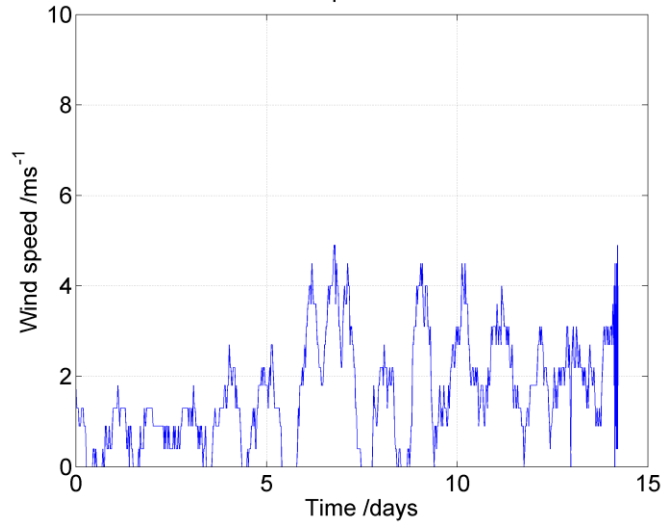


Wind speed vs angle. Max speed = 20m/s  
Max colour means frequency of  $10^3 = 1015$

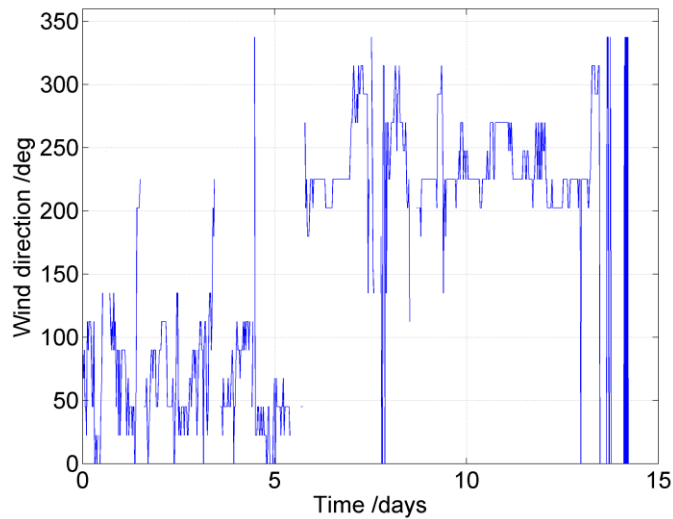


**Data processing chain using Weatherlink, MATLAB, Excel, Python software**

Wind speed vs time

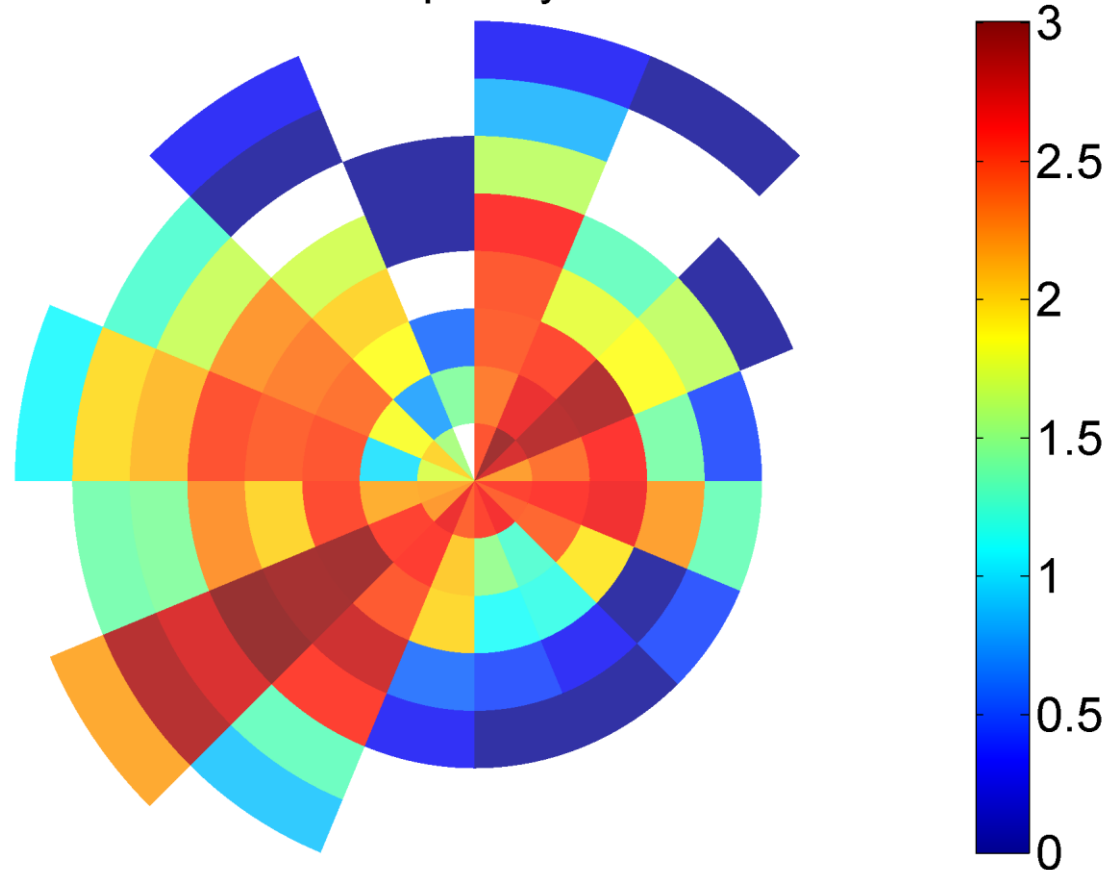


Wind direction vs time



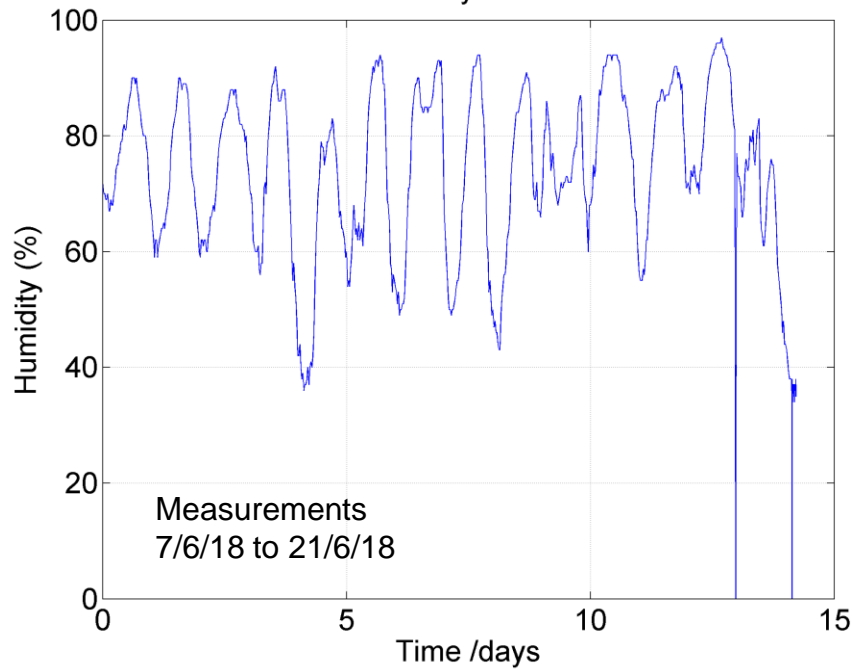
Measurements  
7/6/18 to 21/6/18

Wind speed vs angle. Max speed = 20m/s  
Max colour means frequency of  $10^3 = 1015$

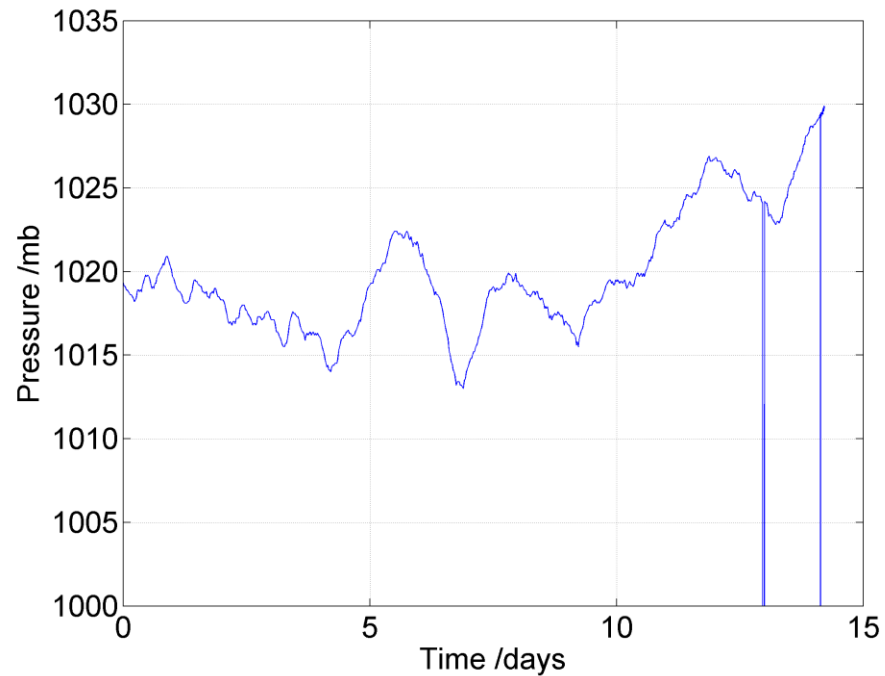


This 'wind rose' displays the frequency of wind measurements in circular sectors. Angle corresponds to 16 wind direction sectors (e.g. N, NNE etc) and range corresponds to wind speed. The colour scale is the *logarithm* of frequency.

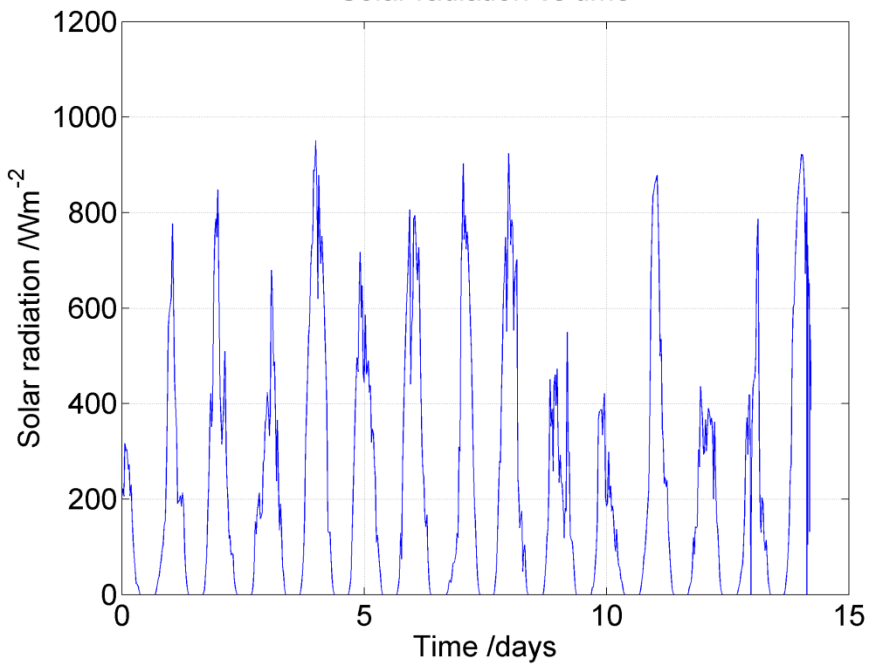
Humidity vs time



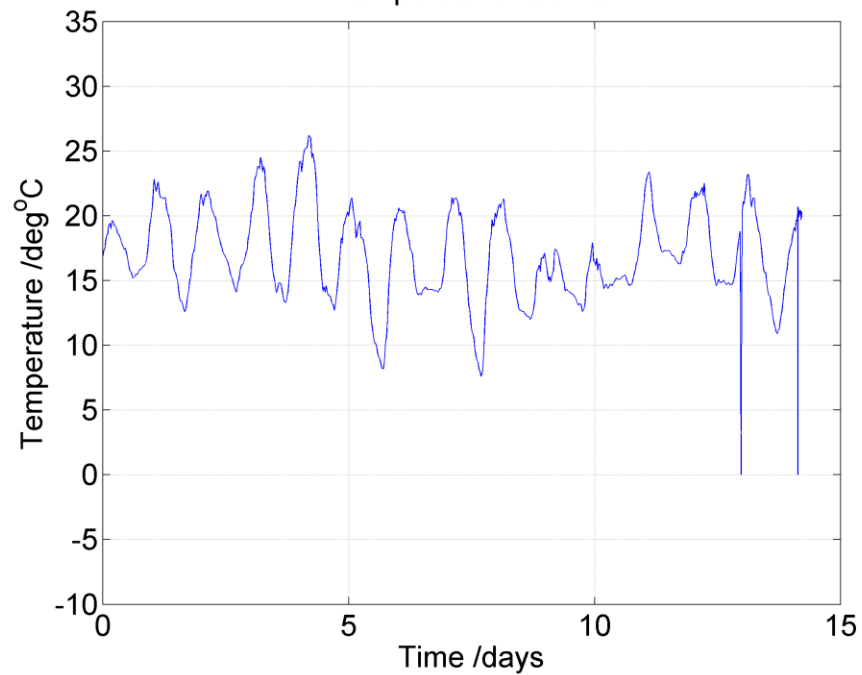
Pressure vs time



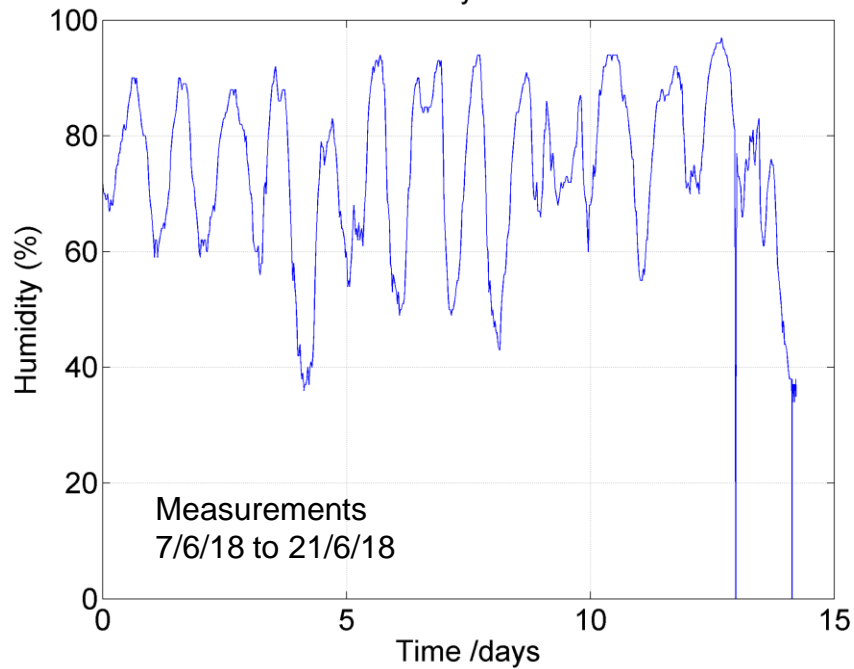
Solar radiation vs time



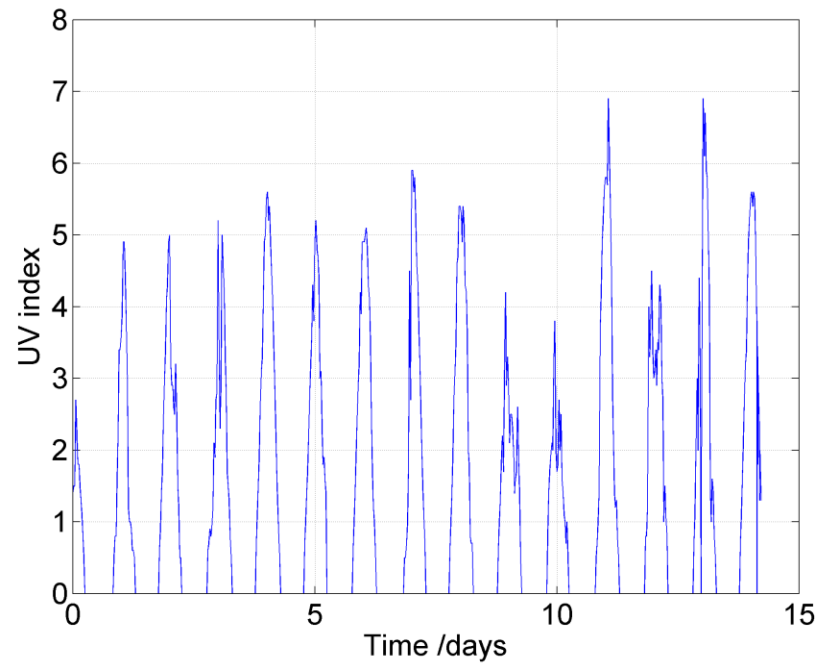
Temperature vs time



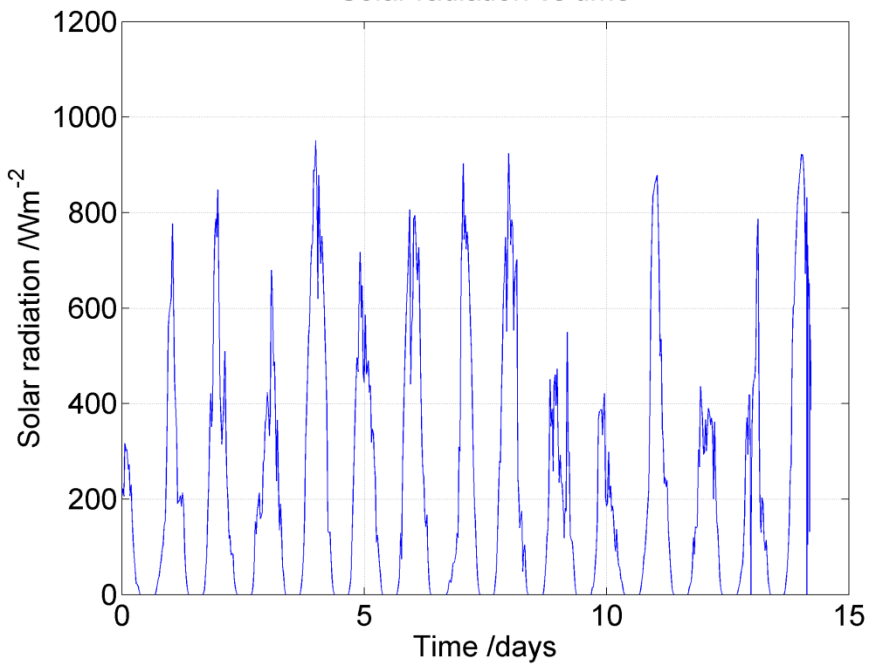
Humidity vs time



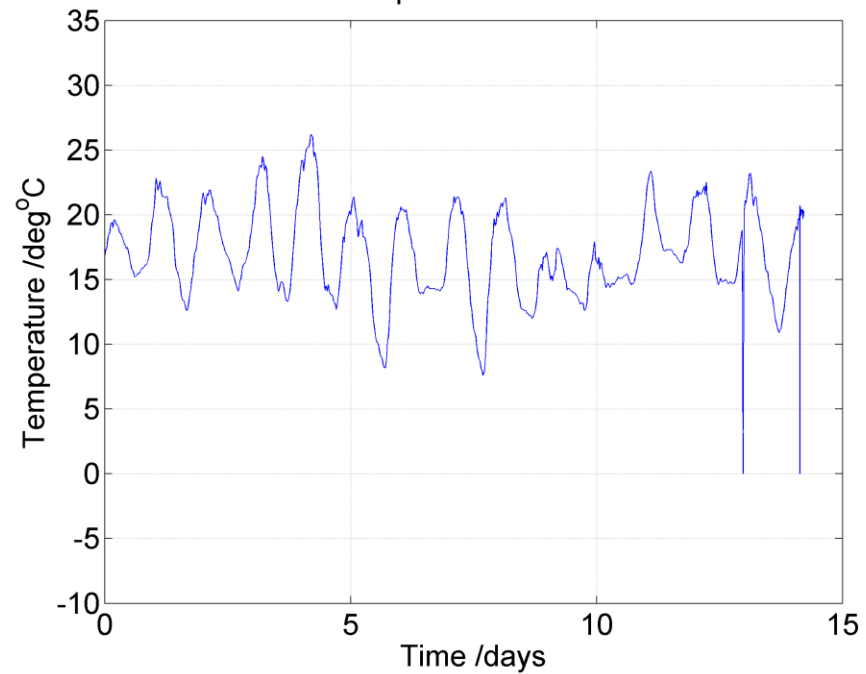
UV index vs time



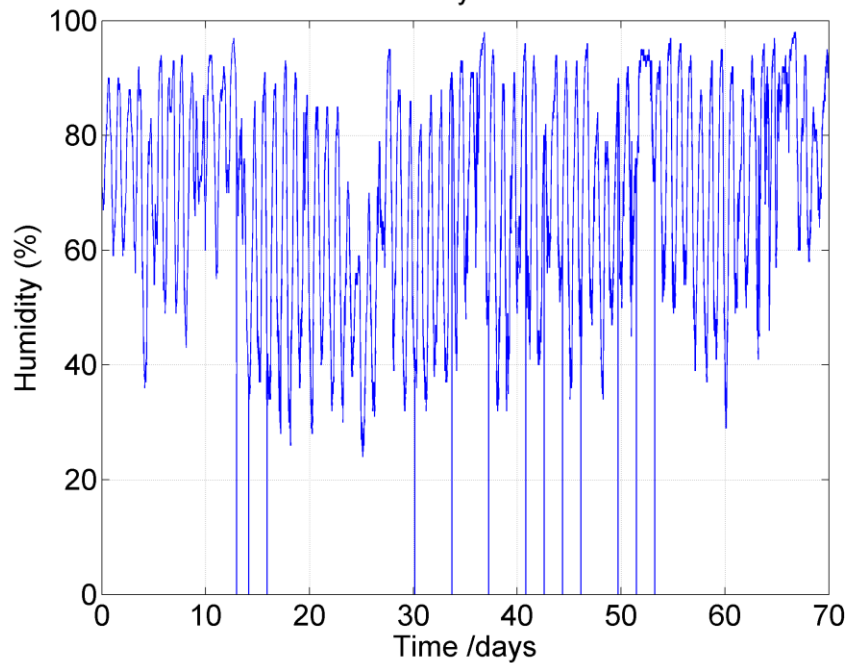
Solar radiation vs time



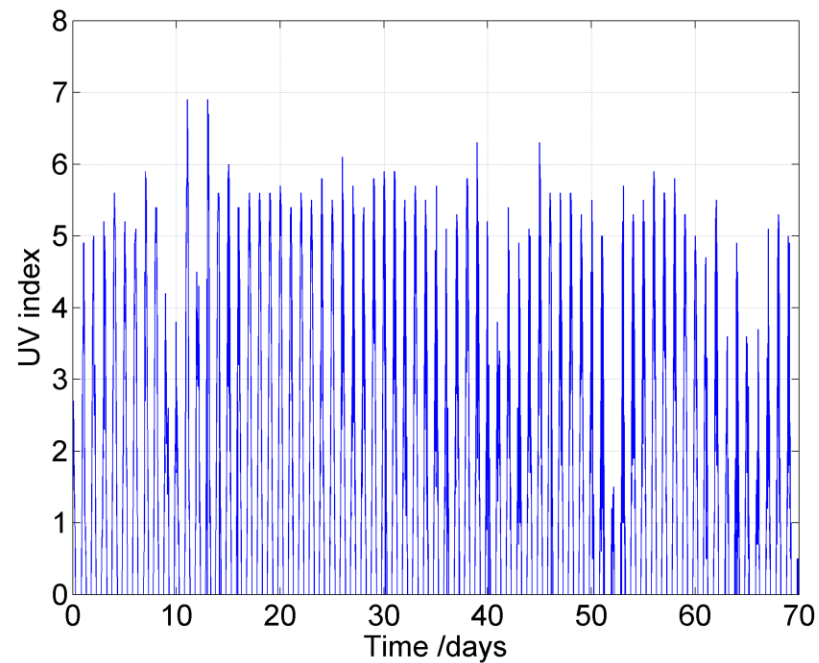
Temperature vs time



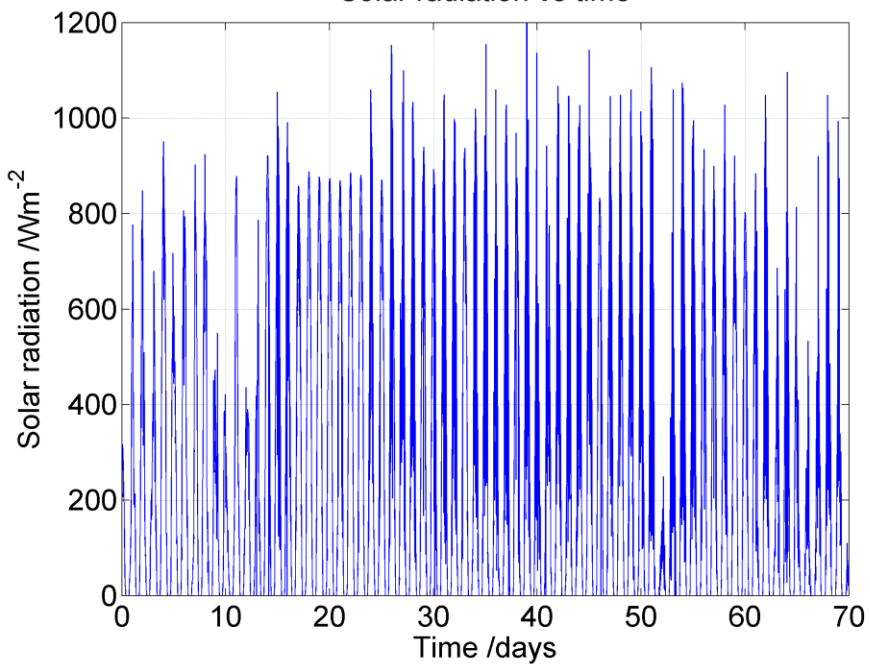
Humidity vs time



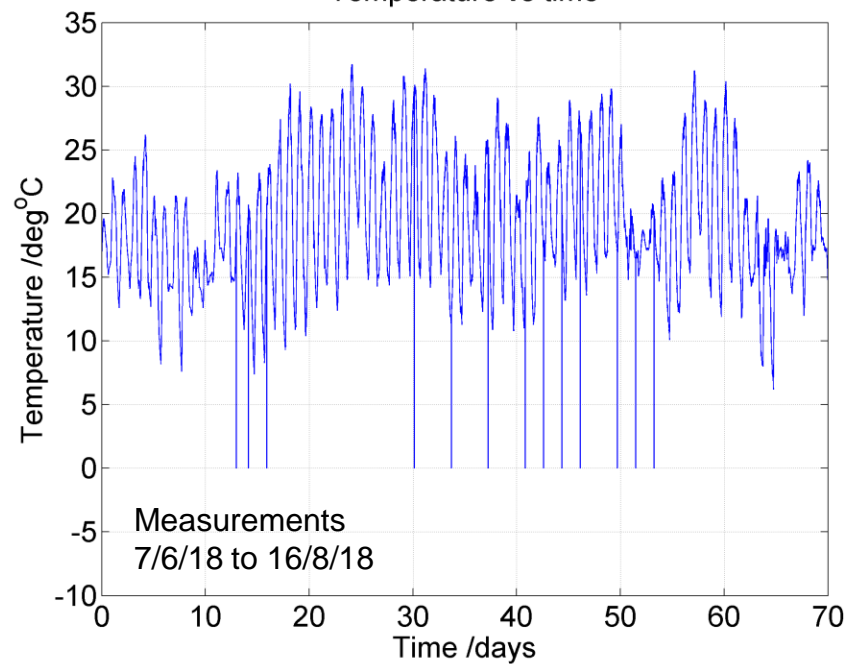
UV index vs time



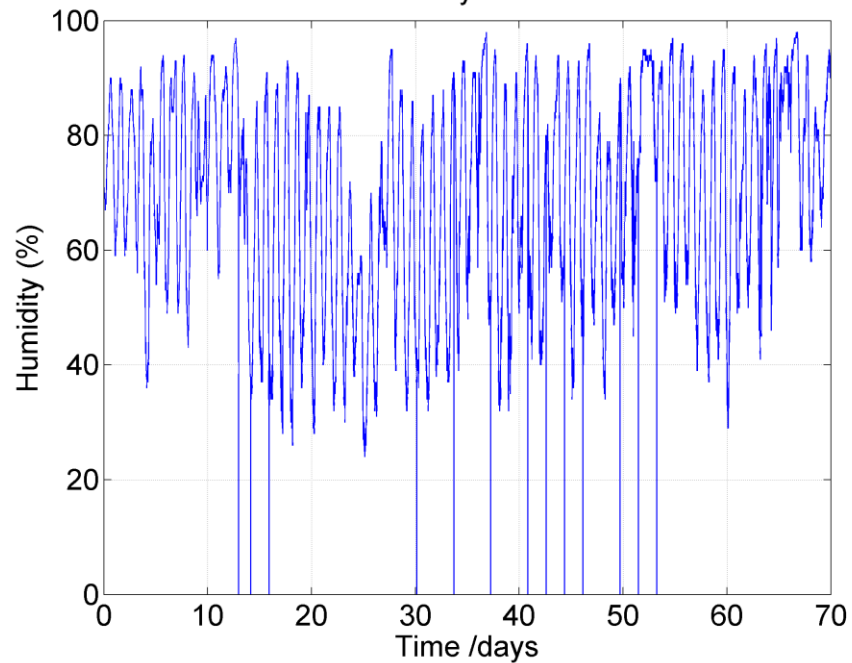
Solar radiation vs time



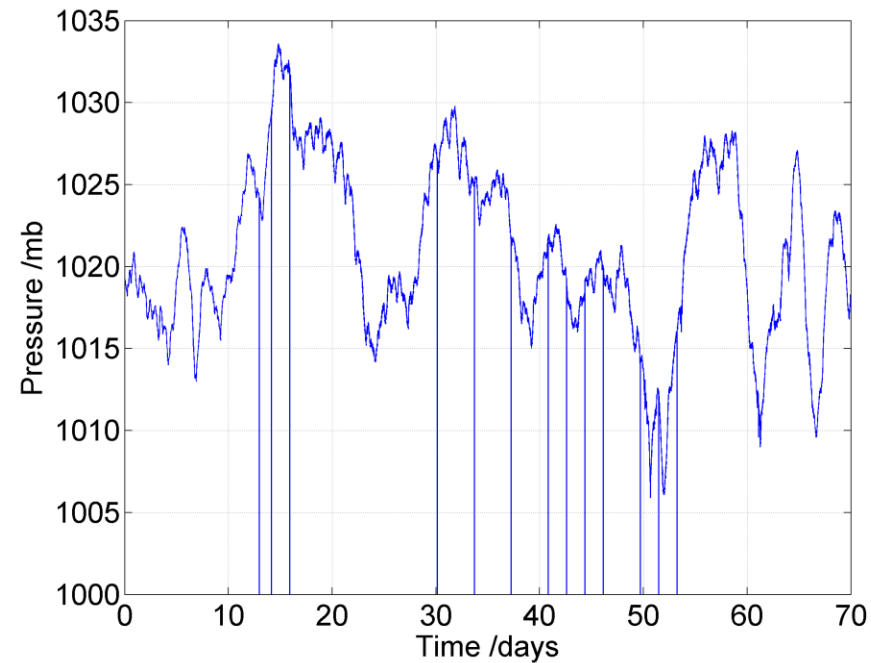
Temperature vs time



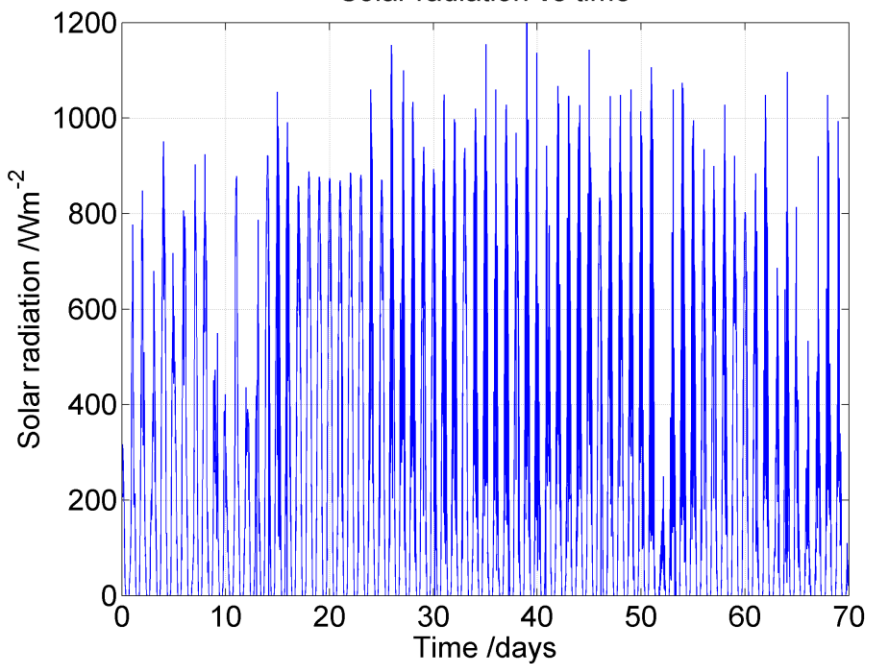
Humidity vs time



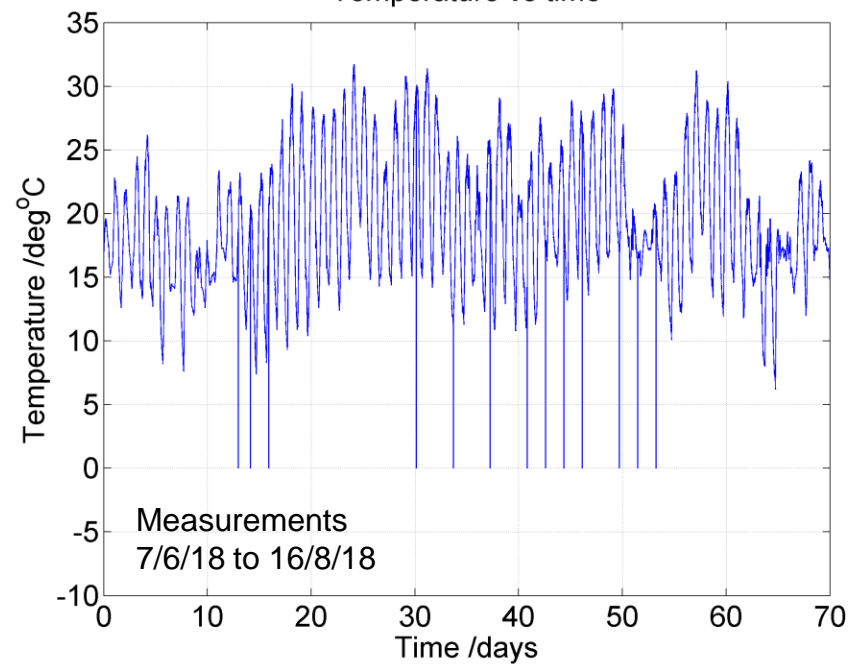
Pressure vs time



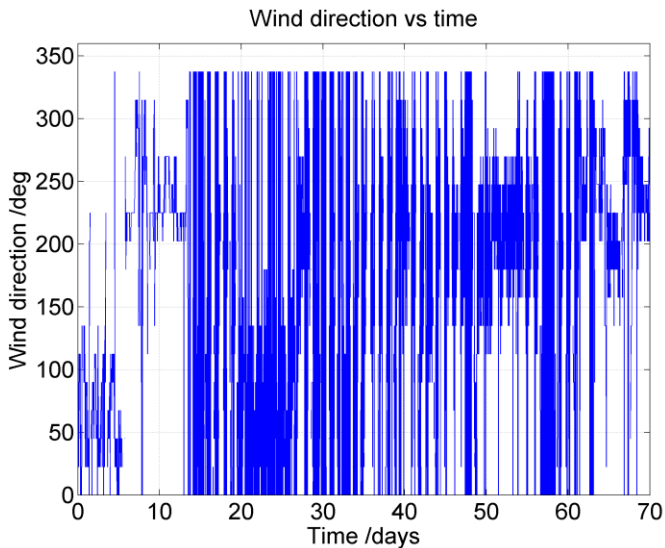
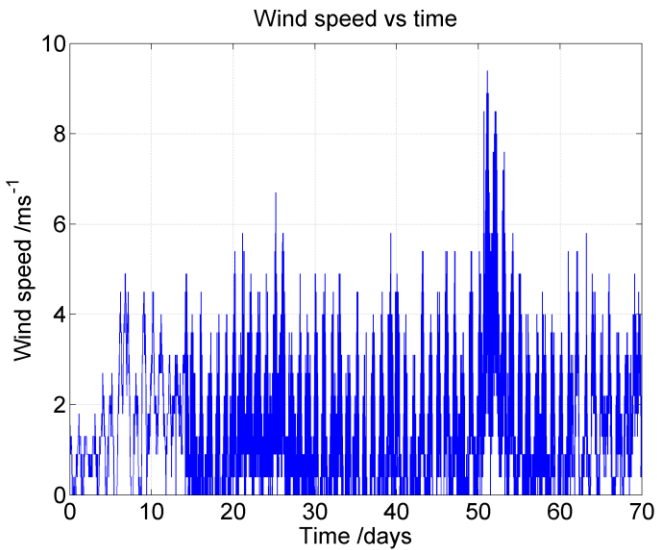
Solar radiation vs time



Temperature vs time

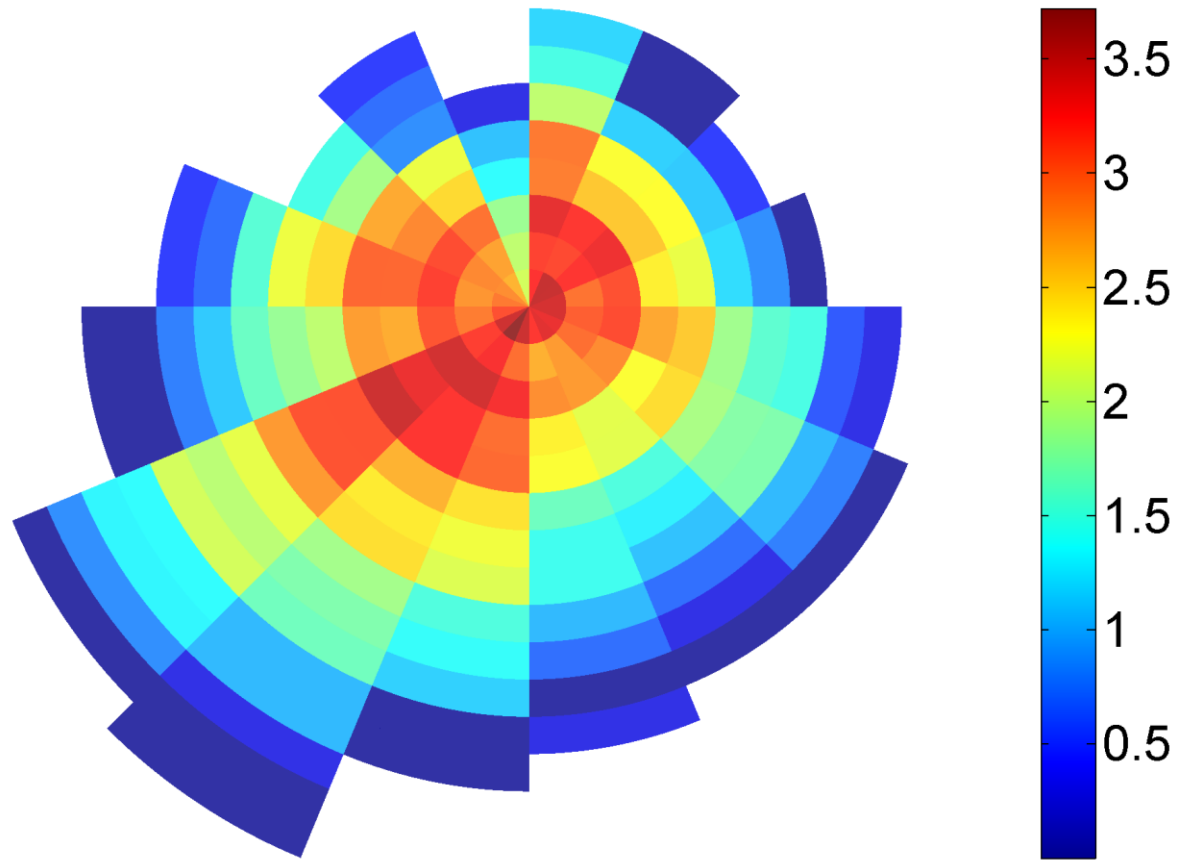






Measurements  
7/6/18 to 16/8/18

Wind speed vs angle. Max speed = 20m/s  
Max colour means frequency of  $10^{3.7} = 5247$

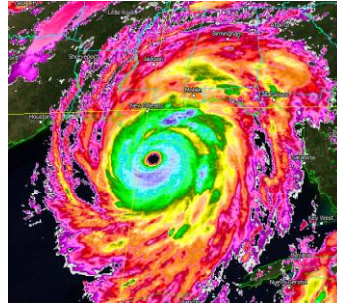


This 'wind rose' displays the frequency of wind measurements in circular sectors. Angle corresponds to 16 wind direction sectors (e.g. N, NNE etc) and range corresponds to wind speed. The colour scale is the *logarithm* of frequency.

## Potential projects

Display data remotely e.g. on a screen and or via a network system (e.g. Raspberry pi + router)

Ingest and process different data e.g. *combine different wavebands* and apply a *formula palette* (rain, dust, cloud temperature...)



Analyse movie frames to calculate wind velocity (note pixel to lat, long conversion!)

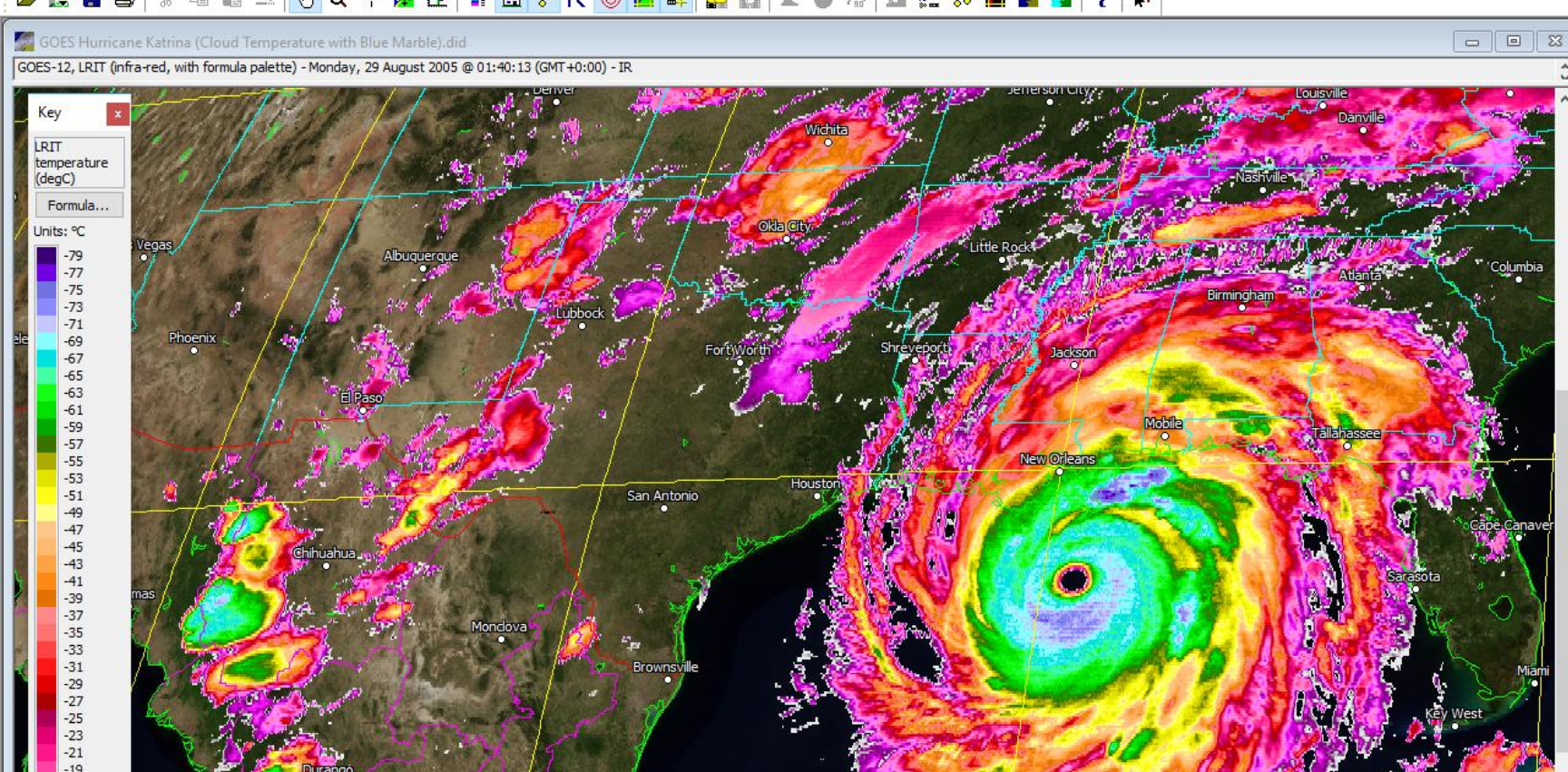
Record hurricane / typhoon dynamics (i.e. trajectory, size, rotation vs time)

Analyse seasonal variation using temperature, solar radiation etc

Is there a prevailing wind? How variable is the wind over Science School

What happens to air temperature, pressure and humidity during a storm?

Maths  
Physics  
Geography  
Computing  
Engineering  
Art  
Div...



Station position:  
 51.058°N  
 1.313°W

Cursor position:  
 X: Y:

Sun zen: Sun az:

Distance: Bearing:

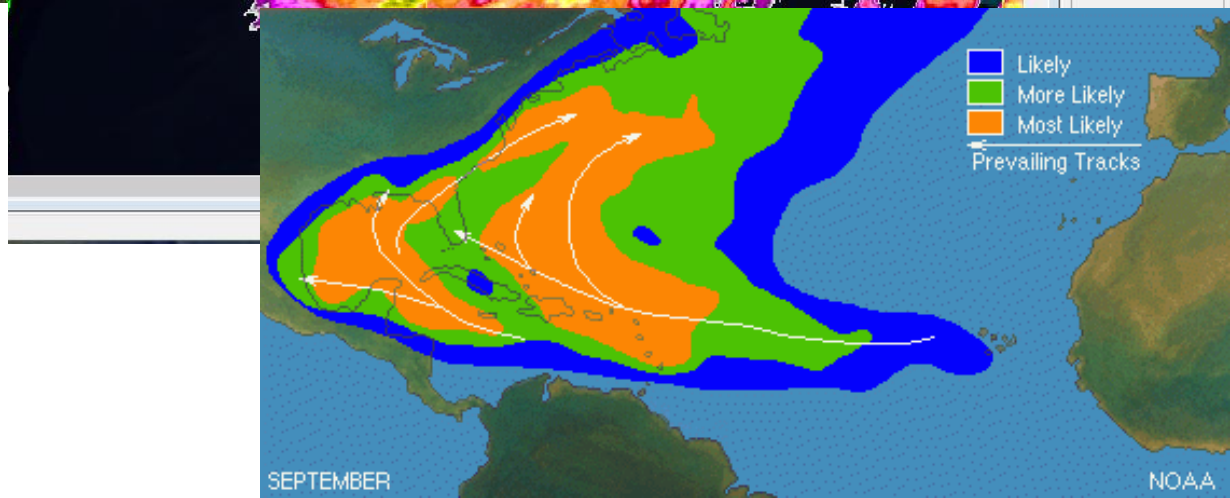
Mag: Size:  
 1:1 2126 x 1521

Plane information:  
  IR

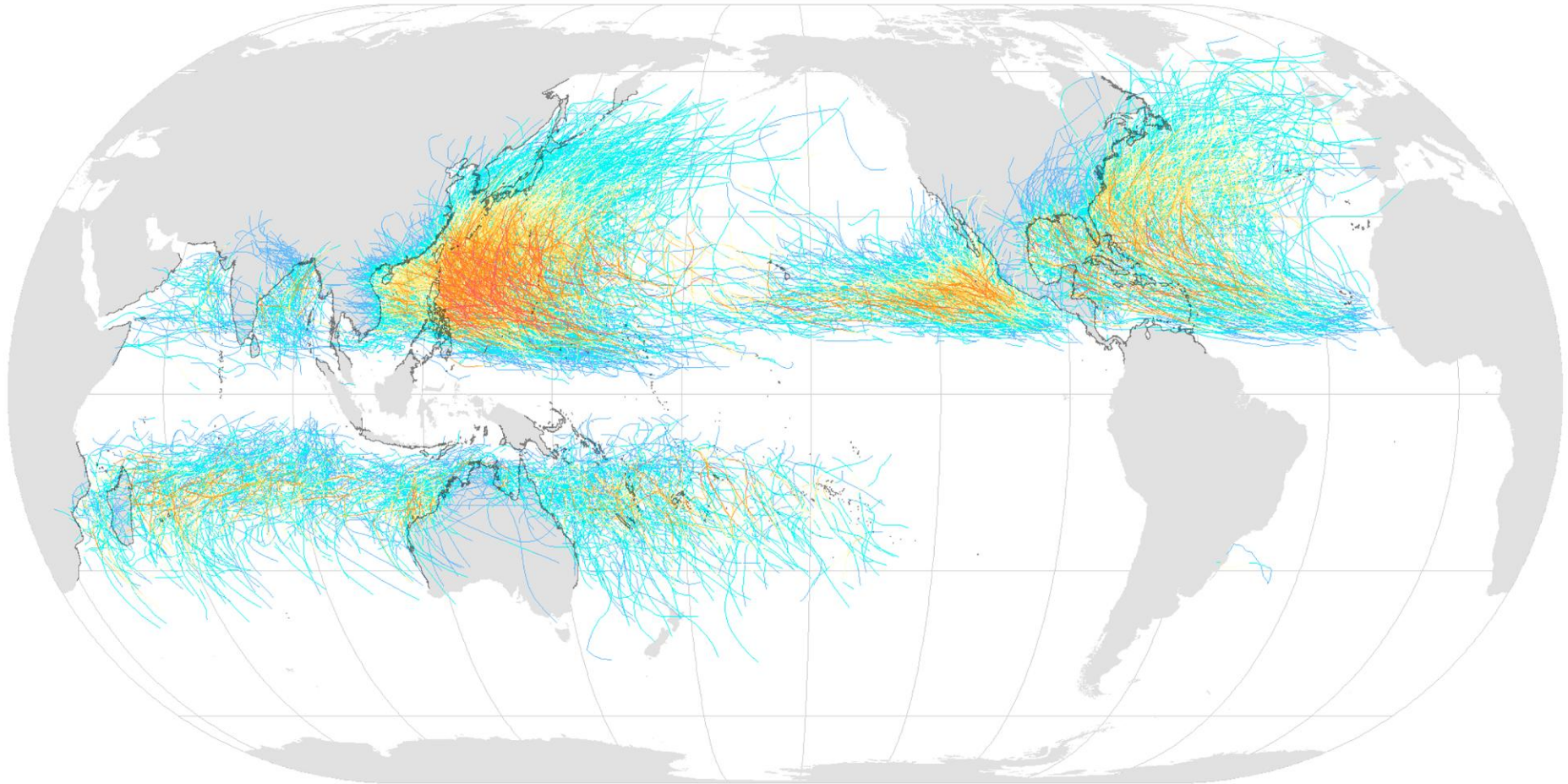
Product:

**Season lengths and averages**

Basin	Season start	Season end	Tropical cyclones	Refs
North Atlantic	June 1	November 30	12.1	[53]
Eastern Pacific	May 15	November 30	16.6	[53]
Western Pacific	January 1	December 31	26.0	[53]
North Indian	January 1	December 31	4.8	[53]
South-West Indian	July 1	June 30	9.3	[53][43]
Australian region	November 1	April 30	11.0	[54]
Southern Pacific	November 1	April 30	7.3	[55]
<b>Total:</b>			<b>87.1</b>	



# Tropical Cyclones, 1945–2006



Saffir-Simpson Hurricane Scale:

tropical  
depression

tropical  
storm

hurricane  
category 1

hurricane  
category 2

hurricane  
category 3

hurricane  
category 4

hurricane  
category 5

Soulik & Cimaron

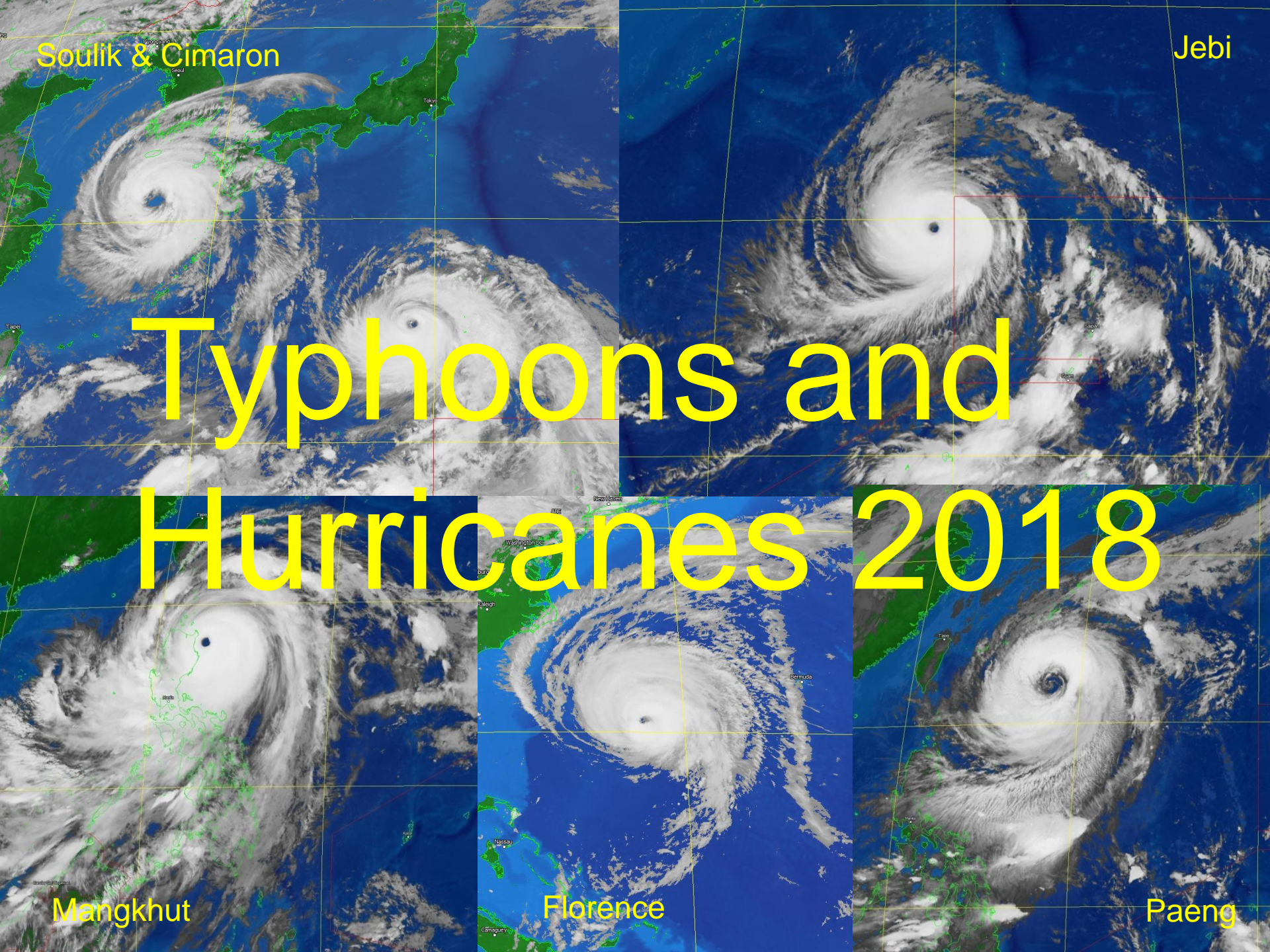
Jebi

# Typhoons and Hurricanes 2018

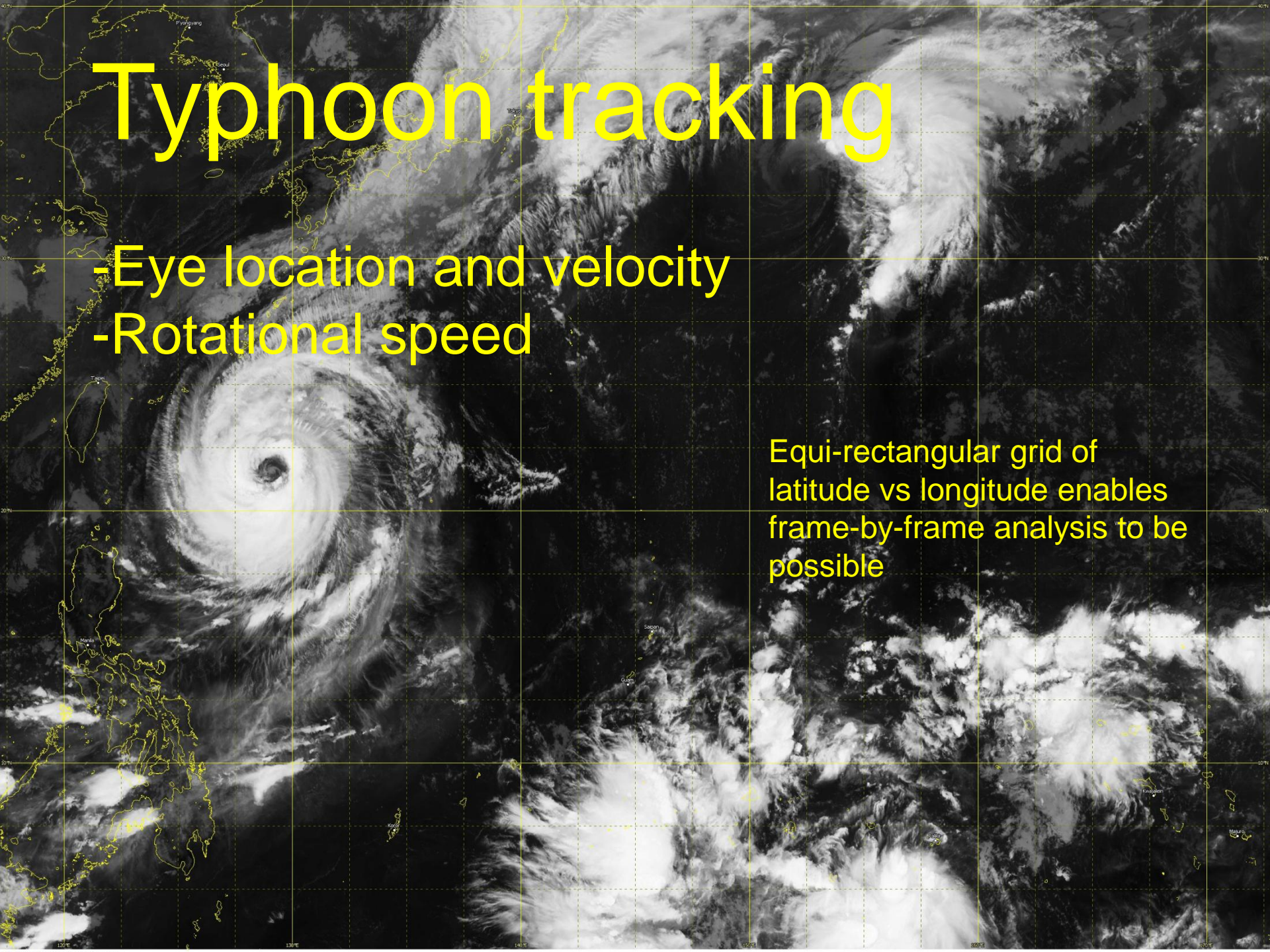
Mangkut

Florence

Paeng

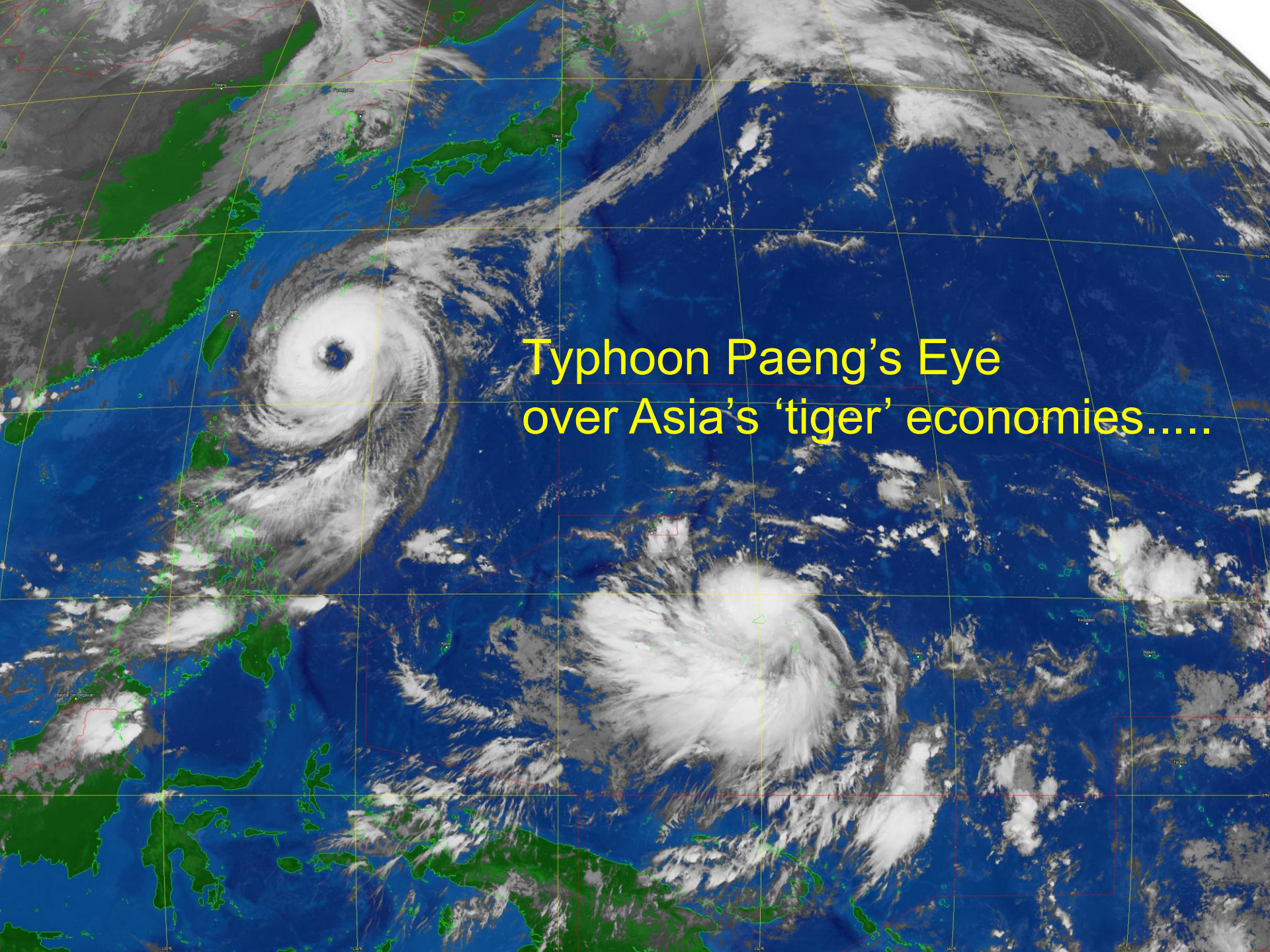


# Typhoon tracking

A satellite image of a typhoon, showing a clear eye and spiral cloud bands. The image is overlaid with a yellow grid of latitude and longitude lines. The typhoon is positioned in the upper left quadrant of the frame. The background shows the dark ocean and some cloud cover. The grid lines are spaced evenly across the image.

- Eye location and velocity
- Rotational speed

Equi-rectangular grid of latitude vs longitude enables frame-by-frame analysis to be possible



Typhoon Paeng's Eye  
over Asia's 'tiger' economies.....

# Winchester College Earth Observation Data Hub

Questions



WINCHESTER  
COLLEGE

