UGRL Scholarship Reflection on Process (Report Scaffold) – Year 1

# General Report Qs

1. What have been the highlights of the project work you have done?
2. How has this scholarship enhanced your knowledge and skills?
3. How has this scholarship contributed to your career plans?

# 12/6/16 – Preparation

* Set up Gantt chart for outline of project plan but not all components can be specified until tomorrow
* Set up the report title page that will be due on the 20th September
* I emailed Katie to check about the money input.
* Tasks before 10am tmr:
* Submit permission form in Annex 7
* Read the 2nd piece of literature in the morning – at least jot down the key points

\* Remaining tasks: Read a literature or two; tutorials for Linux and Vi

# 13/6/16 – Scholarship Day 1/30

\* Tasks before 10am were completed

\* MatLab and all accounts set up

\* Map of Indonesia and stations plotted in MatLab

\* Data identified and received

\* Read most of the literature – aim is to finish the readings by tomorrow

\* Some Linux and Vi tutorials completed

\* Tasks for tomorrow:

1. Finish ALL the literature
2. \*\*\*Filter out all the data to ensure we only have 3-hrly data of DJF for all 175 stations (175 stations x 8 daily obs x 92 days x 11 years = 1416800 plots)
3. Complete some of the Linux and Vi tutorials (can do before coming in)

# 14/6/16 – 2/30

\* All data was downloaded from MIDAS and only DJF was kept – all other months deleted using Vi software (find line number, delete all the irrelevant lines – e.g. 401500;2143000d)

\* Upcoming tasks:

1. Put all data into MatLab
2. Print map and do wind vectors with Beth
3. Get electronic key!

I failed to do the upcoming tasks because of problems with MatLab – I struggled to understand the syntax, so the next day I would need to download a tutorial. This slowed down my process of printing map – also couldn't catch Gary Keech to get my key!

# 15/6/16 – 3/30

\* This morning I downloaded MatLab tutorial

\* Beth didn't understand the read\_SYNOP programme either so we need Cathryn to come and help

\* In the mean time, all maps have been printed and we'll do wind vectors first

\* Aim to see Gary Keech before lunch or alternatively 3pm.

\* But then the wind vector resolution is too low to make plots!

\* So Beth helped me obtain a higher resolution one – by using Python and my MatLab Code for Station\_Map4

\* I am now halfway through plotting the u/v vectors – see the slide on the PPT to see the method of plotting and calculating the angle.

\* MatLab programme for read\_SYNOP now works – had to just change the file name to .mat! - I tested the u and v wind components for all 2003-2013 for station 96163. It all worked properly and I saved the deskwork u and v components.

Task next from Cathryn:

You need to take the .mat file containing the synop data structure (i.e. the output from read\_SYNOP.m) from one example station (use one on the West coast of Sumatra as we discussed). Take the wind speed and direction from the data structure, along with the wind\_components.m script to convert wind speed and direction into the U and V components. Check this script is doing what you think it should be(!)

Use the rotation angle you have computed from the maps to rotate the V vector to be perpendicular to the coast using rotate\_winds.m

Then the next challenge is to use Matlab to compute the mean diurnal cycle of the V wind, so that you have a plot of time (00, 03, 06, 09, 12, 15, 18. 21 UTC) vs. V. This should illustrate the sea breeze, with onshore wind during the afternoon and offshore wind (V of the opposite sign) during the morning.

# 16/6/16 – 4/30

\* Wind\_components script completed by yesterday

\* And all wind vectors have been drawn out

\* Today I used the rotation angle of station 96163 – 70 degrees as I drew and plotted – to rotate the u\_2003 and v\_2003 wind vectors and called them u\_new and v\_new just for a test of the 2003 data in that station. The program used was rotate\_winds.m

\* There was quite a bit of problem at first trying to convert the time into dates from numerics, and thereafter changing the X-axis time into dates with just the specified hour. Beth helped me to fix that and we got a code to load the files from now (see the task 2 word document guide)

\* By the end of today I aim to:

* Figure out how to make my observations 3 -hourly – apparently by finding someway to change the frequency of tick labels
* Take an average of the sea-breeze diurnal cycle for the station – I need to learn for-loops today in the tutorials

I still haven't figured out how to do the 3-hrly observations, but I managed to figure some commands (see task 2 code p2) to get the labels going, rotation, and the minor ticks to the graph – subplots for each diurnal cycle.

# 17/6/16 – 5/30

\* The plot figure is done – no need to put 3-hrly obs but just the -bx to show all plot points as crosses on the graph

\* The next challenge was then to plot a mean diurnal cycle for all observation days – starting with a station in 2003

\* Now my tasks are to

1. Understand the code

> Wind direction is where wind is coming from (270 is west)

> V vector is relative to the north – rotate clockwise relative to that – rotate\_winds programme

> U vector is always +90 degrees. Wind speed rotated should be less than that of original

1. Identify suitable stations with enough data – one of the problems with station 96163 that Cathryn didn't anticipate is the numerous number of 0 wind speeds. I need to find enough stations with sufficient data and not so many missing 0s.

I did verify with Cathryn that the programs for wind components and rotation\_wind are working fine. But I should try to understand fully the rotation from the original, standard u and v vectors and resultant vectors from rotation.

> Change station ID through read\_SYNOP

> Change angle of rotation in windload.m

> Look at original raw data file to identify station numbers!

\* I have identified that some of the station data were very poor. The problem with the land breeze being near 0 and not very negative is actually not too bad – I must clarify with Cathryn on Monday but in DJF the offshore breeze doesn’t reach that negative according to the PPT – only in the JJA months! But again, I will check with Cathryn my profiles so far on Monday.

20/6/16 – 6/30

\* Today, we're just checking which coastal station data is good – Cathryn saw that the Changi type of diurnal cycle is good – should not have too many 0s which means missing data (for manual stations). Also, she said it was right that DJF land breeze is weak, as seen in the PPT data.

\* Now the main tasks to try get done by this week include:

> Verifying all stations with good data using 2003

> Creating mean diurnal plots for all 10 years and only using data from good stations

> Perhaps, take an average of all stations? - We'll check with Cathryn but these are the overline tasks for now.

> These data checks done on 22/6/16

25/6/16 – weekend catchup job

**Email from Cathryn:**

Hi Isaac,

Great progress so far.

The reason I initially suggested using 2003-2013 was because the MJO index data I have ended in 2013. Today I have updated that dataset to the present day, I think it is best that you use the 10 years 2005-2015 (with the final year being DJF 2015-2016), as you suggest to make best use of the good data. (She agreed on my proposal to use better data!)

I still slightly concerned about the stations with lots of zeros. I think some of the data might be useable though. If you can work out whether the zeros are generally at night (when the observations probably aren’t being made) you could use the daytime measurements only at these stations. The sea breeze peaks in the afternoon, so this should still be captured. Don’t worry too much about this quite yet though.

For the stations that only have good data after 2010, I suggest including them but only using 2010-2015. 5 years is probably still enough to get a signal by MJO phase.

Next tasks in order of priority:

1. Produce a single map with the AWS stations and coastlines marked on. Use something like green dots for the stations with excellent data, orange for useable data but that perhaps has missing years or some zeros and red for unusable stations.

> Green for excellent, blue for usable, red for bad data

> On Saturday, I couldn't figure how to get the right code to differentiate the quality of all stations – only changi seems to be reading the code for different coloured dots! I need to check with Cathryn or Beth on Monday.

2. Produce an excel spreadsheet summarising the AWS data. Columns of station id, rotation angle, quality flag and possibly first year of usable data. The flag could be something like 5 for perfect data to 0 for usable – will leave for you to decide. This is so I have a record of the work you have done. This part of the work was quite laborious so it would be good to not have to repeat it.

> Check what Cathryn means by the first year of usable data

3. Find the mean diurnal cycle of rotated v winds (onshore wind) by MJO phase. First, remind yourself about the MJO and its 8 phases:

http://envam1.env.uea.ac.uk/mjo.html

Look at how the sea breeze varies by MJO phase in the models in the Birch et al. 2016 paper (especially figure 11).

Then look at how the 8 phases are defined:

[http://www.bom.gov.au/climate/mjo/#tabs=MJO-phase](http://www.bom.gov.au/climate/mjo/#_blank)

http://www.bom.gov.au/climate/mjo/graphics/rmm.74toRealtime.txt

Also see attached paper.

I already had a script to read in the MJO phase text file, so that is here in Matlab format:

/nfs/a161/earceb/Singapore/MJO\_dc/MJO\_phases/MJOphases\_all\_years\_2016.mat

What you need to do is pick your best AWS station (one with good data along a long bit of coast – perhaps not the Singapore one as the island is small) (this station is 96315) and find the mean diurnal cycle of onshore wind (rotated v) separately for each MJO phase. You should produce a plot similar to the mean diurnal cycle plots you have now but with 8 lines, one for each phase. To do this the script needs to loop through the 8 MJO phases and find all the observation days that occur in each phase, and then average. This could be quite challenging for you so feel free to ask for help next week. I can also explain a bit more about exactly what is required for this part of the project.

This is too much work to do in one weekend. If you got (1) and (2) done that would be great and you can work on the other tasks next week.

**Another task to do on Monday (first thing) would be to download 2014-2016 data and filter out DJF before running the 10 year script**

# 27/6/16 – 11/30

**Tasks:**

1. Download 2014-2016 data and filter out DJF

2. Read the literature on MJO

3. Check the station map code and correct with help

4. Clarify the first year of usable data

5. MJO script

First 4 tasks completed in good time :) See station\_map.m for solution to problem on code. First year of usable data means the start year in which the data can be used.

Today's tasks were done – and Cathryn took over with a very complicated code to separate the 10 year data for all stations in EACH MJO phase – 8 line plot (see MJO\_script for details)

**Next tasks for tomorrow-early Wed:**

1. PROCESS all excellent data on the 'read\_synop' – do this one now

> Error with the evaluate save file – ss needs to account for ALL stations chosen

2. FILL in MJO\_script with all the excellent stations – individually

3. COMPILE a document with all plots – scan ALL hard copies and put in a document

4. INCLUDE some summary plot data down in the reflection – have a separate one for figures

5. DOWNLOAD a copy of the Birch et al PDF

6. START some report – use figure 11 (with black and green lines) and figure 14 (explains why sea-breeze may vary) to start.

# 28/6/16 – 12/30

\* Tasks on the way and error in program (read\_Synop) line 85 fixed (see above)

\* Before lunch, I got most of the tasks done, including getting some notes for the report started, and I only go for lunch after all the years of data has been processed and the read\_SYNOP is done – would take nearly an hour to process all that data!!!!!!

\* Actually...I realised that it would take around 24 hours to process EVERYTHING...I need to keep the computer running till tomorrow lunch. For now, the report – and then I will have to finish up the task 2 tmr – task 1, I didn't anticipate, will take 24 hrs!

**Gantt Chart Created!!!**

**Report notes – project highlights for weeks 1-3**

> Focusing on learning Linux and MATLAB – syntax and how to use them to process the large amounts of AWS data in Indonesia. Although it was tough initially and was not very clear with what I was supposed to do, I was able to eventually gain a clear idea of my project goals, and a much better understanding of Linux and MATLAB.

> Rotating the u and v (horizontal components) wind vectors and calculating v angles for 137 stations.

> Processing the data to assess quality of stations – critical thinking skills and also being able to discern the different standards of each AWS in different locations in Indonesia, Malaysia, and Singapore based on diurnal cycle of onshore and offshore winds (using rotated angle and several MatLab scripts)

> Progressing well and having Cathryn agree with my suggestion to use 2005-2015 data because of better data in later years – I felt that I was able to contribute by making such a proposal and it being carried out for the benefit of her research.

> Using the best AWS stations for all 10 years to develop plots for each station on MATLAB for each of the 8MJO phases (8 lines) – and understanding a very complicated code that Cathryn wrote for me as this was well beyond my competency and experience of MATLAB.

## **Skills and knowledge - project**

> Extend meteorological concepts relating to atmospheric processes and idea of land/sea-breeze in diurnal cycles (relates to lecture 10-11 from SOEE 1400). Also going beyond lecture to apply concepts regarding MJO and its 8 phases to see how sea breeze can interact with MJO to enhance or suppress rainfall in MC.

> Apply these fundamental knowledge of physical processes to latest research conducted by Dr Cathryn Birch,

> Skills developed include learning how to use a Linux computer, some basic Vi commands, and most of all, MATLAB. (Need to elaborate the types of programming knowledge learnt like for-loops, basic syntax etc.)

## **Leadership Training**

> Reflect on Weetwood notes regarding presentation, some introduction to teamwork and leadership, project management, critical thinking

> Selside – teamwork skills built with many activities – talk about the aspects of being a true leader (responsibility, confidence, communication etc.) and that of a team member (co-operative, creative, innovative, dedicated etc.) and use a Venn diagram to compare the two. Outdoor skills like caving and gill scrambling – secondary but very fun and enjoyable – can briefly mention this too.

**Other Opportunities**

> Ambassadorial duties – volunteering to help out with events such as PICC and CEMAC launch and picking up new skills in communicating with others, and trying out something new – ushering people and being in charge of registration. It was quite an enjoyable experience, especially being able to network with some of the lecturers in my department, and meeting those who took my lectures. Also a great opportunity to get to know my other fellow scholars, and also other students studying in Leeds over the Summer. Both networking and leadership skills here (while getting paid for the extra 9 hours in the first 3 weeks!)

> Talks on PICC and CEMAC – refer to your notes – reflect what you learnt about the big issues going on, and also getting an insight to the workings of the university teaching and global issues relating to climate change and meteorology well beyond the scope of my course – of course this applies concepts that I know of already from lectures.

> Learn to make full use of all opportunities and the most of the scholarship – 1500 pounds motivation for things such as Manchester conference 4-6 July – reflect on this in Washington DC

## **How has the scholarship contributed to my career plans?**

\* Development of relevant skills – soft and technical (see above to make a list)

\* Opens my eyes to new opportunities – e.g. volunteering and networking to increase employability. It also helps me get an idea of what it is like to be engaged in current research, and in my project, an office environment – I know for sure that I would like a career that involves more practical aspects – and perhaps some outdoors instead of being confined to the office every time . A balance of office and practical fieldwork would be great!

\* Clearer idea of the kind of area I would like to focus on in the future. I do know I want something practical and active!

***My task at home is to finish the paragraph on presentation/project management skills as my notes are left at home! I aim to do this before entering the office tmr morning.***

# 29/6/16 – 13/30

Report on skills and knowledge complete. Report introduction notes:

1. Overview of project – done
2. What is the MJO and define phases (use figure)
3. Explain interaction with sea-breeze briefly

This aims to add background context to the project.

**Plotting the MJO phases issue**

\* The data was finally processed after 24 hrs!!! BUT now I face another problem – the graphs are not plotting!!!

\* Cathryn said the issue is that all stations are being read – should only read one at the time

\* So I need to check that now by:

1. Running read\_SYNOP until 2-3 stations are read
2. Use Linux and load “ls – ln \*\_DJF\_Indonesia\_read\_SYNOP\_48698” to ensure file read today – just the Changi Airport one.
3. On Matlab, load on the command window one of those files read and see the list – use datestr(synop.ob\_time) to check all times
4. If only one obs, run the script AGAIN for 24 hrs! If not, inform CB.

I did all that in 5 mins – it worked – so now I have to run it all again – and task 2 can only be completed tomorrow :(

**Anyhoo, some work to do NOW**

1. RECEIVE the email for the report
2. FOLLOW the comments and make the appropriate corrections in the report

* Zhang 2005 for reference of original source
* Explain more on the 8 MJO phases
* Include results – some of the figures in the reflection
* Include a diagram from storm initiation reading to be sent

In 10 hours, the data should be processed – you can do that all tmr morning. These two tasks above must be done by today.

# 30/6/16 – 14/30

* The data has all been processed…but IT’S STILL NOT PLOTTING!!!
* I suspect the problem is to do with the 2016 – no December – but not 100% sure so I will discuss with Cathryn very soon.
* In the mean time, I will finish my report.
* The mistake was not as I said – but was in the variable “years” – we need to avoid defining/assigning a variable that is already a function in MATLAB
* So the code was changed to str2num of the filename and 1:4 to get the first 4 digits – which is the years

**Tasks for today**

* 1. PLOT all 25 stations – bearing in mind 96315 as the model example
  2. INCLUDE one of the plots in the report for the results section
  3. COMPLETE the results part of report with some text to explain/describe the process
  4. SEND the figures and the updated report to Cathryn and ask her what else I need to do next – at least get some readings and a plan for the 2nd half

**Looking Ahead**

Looking at your plots it seems as though v\_new is higher in the dry phases (though it is difficult to tell).

The next steps are to extend and refine the analysis:

* 1 Compute the sea breeze strength (currently you have just the onshore wind). Sea breeze strength is as in my paper [v\_new at 1400LST] – [mean v\_new]
* 1400LST = UTC + 7 (so 7 UTC)!
* I struggled with the times – but realised it’s the MJO phase vs. time vector – v\_new\_MJOphase (:, 3) – for 3rd plot (06 UTC)
* But eventually I got it and got the mean v\_wind with 8 for\_loops.

-          2 Make a single plot showing the average diurnal cycle over all the stations

-          3 Average over the wet and dry phases – there should be a difference between the two

-          4 Plot MJO phase vs. onshore wind and sea breeze strength (averaged over all the stations) like in my paper

-          5 Do more close checks on data quality. Is all the data you are using fit for purpose? Are there other stations that could be included (e.g. ones with good data only after 2010)?

-          6 There are other extensions such as looking at onshore wind convergence in model data

I suspect the above will take you until the end of the next three week period. For today and tomorrow focus on getting the report done and then look at points 1 and 2 above. (1) should be easy enough for you to do by station.

Include as a target in the report that you will present your project work at a group meeting in the next 3 week period.

Over the summer, if you have time and wish, I recommend focusing on learning Matlab. I think you have a good handle on everything else and it is the programming that is slowing you down the most (to be expected at your stage!). Try and pick some programming courses next year. There is a year 2 matlab course available.

**Tasks for today and tomorrow (the Final run)**

* + 1. ATTEMPT the mean over all stations.
    2. CREATE a similar plot for the onshore wind on Excel (use the for\_loops and 1400lst to get the average sea breeze for each phase over ALL stations)
    3. DOCUMENT these in the report if you have time – so you can remember what you did for September.
    4. CORRECT the few suggestions on the first part of the report.

Notes:

* Put text b4 figure
* Be careful of certain terms used – e.g. correlation

# 7/1/16 – 15/30 – HALF TIME

* Tasks – onshore wind for ALL stations obtained
* So now:
  + - 1. OBTAIN sea breeze for all stations – try doing it on Matlab
      2. FINISH report and include some example sea breeze plots for individual IDs, onshore for all stations, and average sea breeze for all stations
      3. BACK UP all files

The tasks have all been completed. For the mean sea breeze, I struggled a bit with the code as I had to make my formula and logic for matlab more generalised, there was only 1 plot of sea breeze vs MJO phase required, and the x-axis was wrong (supposed to be [1:8] instead of [0:3:21]).

The report is done up to now, and so everything for the first half is finished. YAY!

# 2nd half – 5-26 September 2016

**Preparation work – 29 Aug to 4 September**

#### 29/8/16

* Review of progress and programs so far
* Review of MJO, seabreeze etc. concepts from readings.
* We’ll start on the presentation tomorrow!

#### 4/9/16

* + - * 1. Summary of tasks completed so far:
* The key plot from my paper is reproduced  in Fig. 4 – which shows a clear change in onshore wind by MJO phase in both models and also in the sea breeze in RCM12. The sea breeze in RCM4.5 was more complicated as there was a lot of variability in the wind at night, which affected the [afternoon wind] minus [mean wind] calculation of the sea breeze.
* Isaac downloaded all the weather observations over the Maritime Continent and identified the stations with good 3-hourly wind data over a 10 year period (Fig 11). He then rotated the wind vectors to be perpendicular to the coast and computed the mean diurnal cycle of onshore wind at each station (e.g. Fig 12).
* He then computed the mean diurnal cycle of onshore wind for all stations (Fig 16) and then the mean afternoon sea breeze by MJO phase (Fig 17). It is quite remarkable that Fig 17 is so similar to the models in Fig 4.

#### Tasks to do in order or priority in the 2nd half (Use for Gantt Chart)

1. Go back through the AWS station data and check the data quality in more detail. Also include stations that have good data but for less than 10 years (including post-2010 only).
2. From Simon Peatman: Create a MJO phase vs sea breeze plot, just averaged over the stations that are located within the model domain of Birch et al 2016 (dashed square fig 1). (Started and Completed on 7/9/16)
3. Time difference between the east and west of the domain used for Simon’s recommended plot - Check for a difference in the MJO phase vs. sea breeze strength plots as you go west to east across the Maritime Continent. The MJO onsets in the west first, so there may be a change in signal in the longitudinal direction. For this it would be best to split and average the stations into 4 sectors (west, centre-west, centre-east and east?).
4. Plot the mean diurnal cycle of temperature by MJO phase. This will help explain why the sea breeze strength varies by MJO phase.
5. The final task is to look at some model data from my 2016 paper. You may not have time to do this and it will be best left until the final week when I am back.

E1: (Plot a land-averaged rainfall (daily mean and diurnal amplitude) to show motivation for sea breeze vs. MJO rainfall. This will show if there is a relationship in how close the peak in sea breeze is to the peak of diurnal rainfall. Think: How does it compare with obs? Model bias? – We know there is bias where MJO cycle of sea breeze is much weaker than the model.

E2: Plot low-level wind convergence and rainfall to clearly demonstrate the link between the MJO, sea breeze and rainfall.

**Tips for task 1**

There may be a small number of anomalously large or small values that could disproportionately impact the means.

Set some thresholds, where values above and below these are considered unrealistic values and are set to NaN. This would be for the stations you are currently using and any others that you decide to add.

First thing is to take Beth through your scripts and explain what they do and she will be able to make specific suggestions about how to check the data.

 Write a script to produce DJF timeseries for each year and each station. You can then flick through all of these to visually inspect the data. You could also try using medians instead of means – if the results using means and median are similar, it suggests that a small number of spurious values are not having a significant impact.

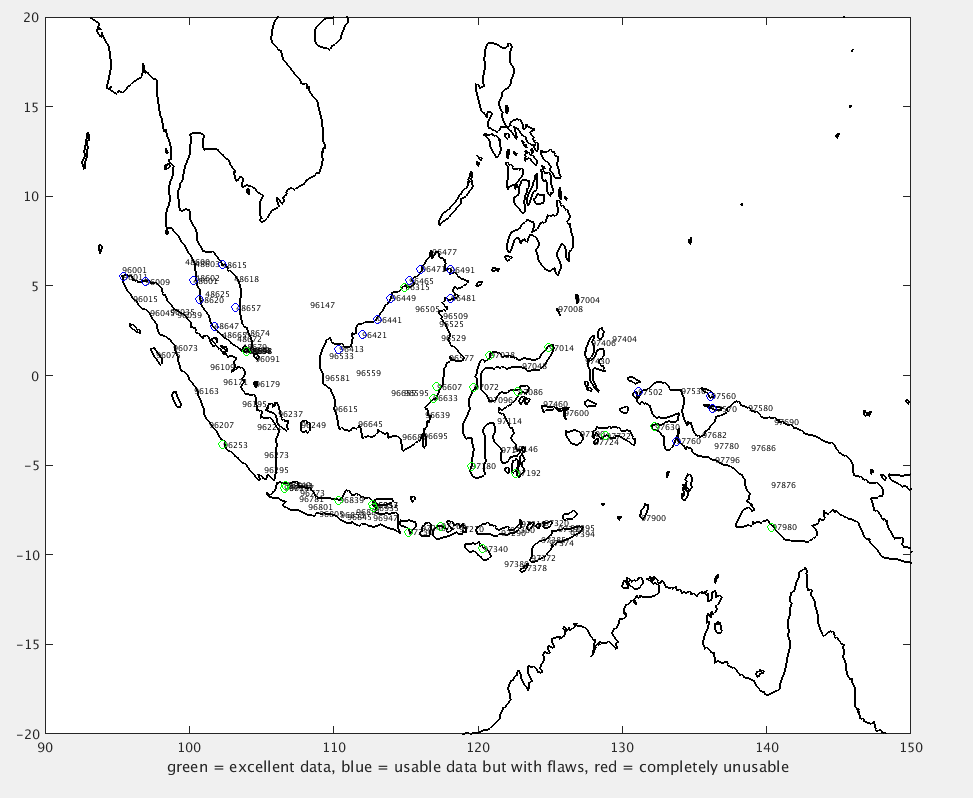
 Insert error bars or some kind of illustration of data spread onto your MJO phase vs sea breeze plot. Start by trying +/- 1 standard deviation from the mean.

**Reflection on today (Day 16/30)**

* + - * I categorised and wrote vrbs for the 61 stations into:
* Good data (26 stations)
* 2010+ data (20 stations)
* zeros data (15 stations)
  + - * CB did not want me to use the zeros one so I’m checking if exclusion is necessary. Regarding some stations with 6hrly data until 2010, Cathryn also did not want to include those as they have to be interpolated and that causes problems.
      * I ran the read\_SYNOP file with all 61 stations. So I will have to delete the relevant ones – unless they have good data with less 0s from 2010 onwards which I can check after the script is finished (it may take overnight so that will be tmr)
      * For the 2010 one, I can use the same script as MJO\_script. I only need to remove the plots preceding 2010 – maybe except for the one year with 2009.
      * *The aim for these few sessions is to write a separate script for the stations with good data 2010+ and combine it with the MJO\_script in another main script which has the best data to make a single plot for sea breeze vs MJO and diurnal cycle of mean onshore wind*

**6/9/16 (Day 17/30)**

* + - * I sorted all the categorised data into separate folders for the separate scripts
      * While checking the stations for 0s to see if I can use data from 2010+, I realised I needed to check all again to see which data can be fully used from 2005 and which from 2010 or other years and beyond.
      * Now I need to create a new station map to show which stations will be used afterwards
      * Looks like I’ll have to tackle the code to get a single plot for all used stations tomorrow! – It’ll be about 40 stations in total after ridding some due to too many 0s.



**7/9/16 (Day 18/30)**

Tasks:

Update CB on station map

Attempt to use a single script (an idea that popped up yesterday) to plot the mean onshore wind and sea breeze – use the MJO script with the station data from a particular file to accommodate all conditions (all data and 2010+ ones) – IT WORKED!

Check the stations that fit in the domain of Birch et al. – DONE!

Next things to do:

Check medians and compare plots with means

If big difference, do the threshold function such that values are set to NaN if >20 or <-20 m/s wind speed – the speed is really in knots, so convert that to roughly 40 knots.

ADDITIONAL SETBACK: Beth said that there are still too many 0s in some stations! We need to check the files again. So instead of doing it manually, I’ll attempt a script to check the no. of 0s in a good and bad file to define a threshold with Beth thereafter on which ones may have to be removed from DJF\_allscripts

Reflection:

* + - * Remove\_highvalues.m was incorporated into MJO\_script to take out all the abnormally high or low values and those set to NaN.
      * We then had to look at how to set a threshold of the maximum number of 0s allowed in a particular station and year – another script was created using similar code called data\_check.m to check for good data. This concept was then incorporated into the MJO\_script.m such that we set a variable x = find(u==0) – wind speed 0. And if the length (or number) of x <= threshold number, we run the loop to process the stations. So I could add the stations that I categorised “zeros” and have the indir file of DJF\_data\_check
      * Because of the distinct difference between thresholds (100 and 200 tried so far), I will send CB a 10 plots (2 each):

Original

Median

Mean with high values removed (>20 and <-20)

Mean with high values removed + 100 zeros max

Mean with high values removed + 200 zeros max

**8/9/16 (Day 19/30)**

Update: Updated MJO\_script code now copied into MJO\_domain for the domain ones. I only need to put error bars in one of the scripts. When it works, I can copy and paste into the other.

Cathryn’s input on the plots

* 20 knots threshold good
* 100 0s is a more realistic threshold – but check 5 stations manually to make a decision on whether to use gray stations with zeros (as they could be consecutive or at specific times) It is possible that they may have to be ignored.

The other thing I looked at is instead of absolute value thresholds, using percentages – me and Beth agreed on <12.5% 0s as this will guarantee eliminate all the repeated 0s at designated times of the day where there are no obs. However, this means using 155/398 of the files that contains the good 41 stations and 243 excluded.

***REMAINING TASKS FOR THE WEEK***

Task 1: Error bars into sea breeze plot - +/-1 standard deviation – send to CB and CC Beth. (For now as CB said, the standard error – STD/no. stations and STD/((no obs/8)))

Task 2: Plots 5-6 sent to Cathryn – try using a median for that (separate script)

Task 3: Check if 0s for 5 stations are at a specific time of day (manually) – 60 checks total – we’ll then make a decision to see if we should use 41 stations (with limiting the 0s) or all 61 stations (I think the decision will be get rid of the 20)

**9/9/16 (Day 20/30)**

Task 4: Split map into 4 sectors and get plots for each – then plot the standard deviation

* + - * First, distribute the 41 stations into excel
      * Use the 12.5% threshold for 0s, and 20/-20 knots - Matlab
      * Plot mean and median on same axes to keep as options in each sector

It’s better to do 3 regions – due to more even number of stations per sector (and also less error) – I experimented and discovered this.

Task 5: Read off data from Birch et al fig 11 – convert values/estimate in m/s and superimpose on the graph (put values from her figure into matlab)

* This task was done with quite a bit of ease
* I also looked at the difference between the model and my observations to see how much disagreement there is between CB’s results and my results.
* This task only applied to CB’s domain as marked in her Figure 1. So it did not work for sectors 2-3.
* ***Conclusion: Model not reducing sea breeze enough in phases 3-6 but good agreement when higher breeze. Generally, troughs and peaks are underestimated.***
* ***Onshore wind: agreement that strongest in phase 6-1 and weakest 3-5 (CLARIFY WITH CB)***

The week’s tasks were all successfully completed

Next: Temperature vs MJO phase using Read\_SYNOP files (and the temperature variable). May probably need an additional script to check 1-2 stations manually for dodgy data so as to set appropriate removal thresholds.

#### 12/9/16 – week 2 start (Day 21/30)

**Tasks**

- For the comparison plot with Birch et al. 2016, just use the mean (the model values are means) as this will allow you to expand the y-axis.

- For the 3 sector means/medians - can you plot them on the same axis. i.e. one plot of the 3 means and one plot of the 3 medians (This took ages, and learning cell array structure with curvy bracket)!

- Temperature plots

1. Remember to check data quality in a similar way that you did for wind.

2. Make similar plots to what you did for wind. i.e.(1)  the mean diurnal cycle (one line for each of the 8 phases) –

3. (2)Plot the mean and median temperature at ~1600 LST (i.e. the time of the peak temperature) by MJO phase. One line for each of the three sectors. Note mean does NOT need to subtract the nanmean of all stations but I will clarify with CB at the end of the day.

- You could start preparing your presentation for a week on Friday - i.e. the introduction and aims. You mainly want to present what is in your report (the science part) and then add in the results from these 3 weeks,

- The next task is to familiar yourself with plotting maps of model data. I will provide you with some example scripts and data but it's getting a bit late tonight to do that(!) so I will send this later. Let me know if you think you are close to finishing the tasks above, though I expect these to take at least a few days.

**13/9/16 – 22/30**

An additional task:

Another thought is to evaluate quantitatively if there is a lag in the phase between the 3 sectors. To do this you can use lag correlation (sometimes called cross correlation):

[http://uk.mathworks.com/help/signal/ref/xcorr.html](http://uk.mathworks.com/help/signal/ref/xcorr.html" \t "_blank)

[https://en.wikipedia.org/wiki/Cross-correlation](https://en.wikipedia.org/wiki/Cross-correlation" \t "_blank)

The wikipeda page makes it sound very complicated but I think all you really need to do is input the 8 mean sea breeze strength values for sectors 1 and 2 into [[r](http://uk.mathworks.com/help/signal/ref/xcorr.html" \l "outputarg_r" \t "_blank),lags] = xcorr([x](http://uk.mathworks.com/help/signal/ref/xcorr.html" \l "inputarg_x" \t "_blank),[y](http://uk.mathworks.com/help/signal/ref/xcorr.html" \l "inputarg_y" \t "_blank)) as x and y. Then repeat for sectors 2 and 3 and 1 and 3.

If you struggle with this I can help you next week. I have done this before, so would need to dig out the old work to remember exactly what I did.

***I got the plot, but don’t quite understand what it means!***

So now back to temperature…

* Data quality checks and entire task complete!
* Just check with CB the 3 sector mean and median plots
* If time tonight, orgnaise plots nicely and send to CB. Otherwise, do so tmr!
* Worked on report tonight!

**14/9/16 – 23/30**

* + - * Yes, the formulae for temperature by MJO phase are correct
      * I can now work on my report/presentations stuff and hopefully get the donor’s letter in too!
      * Plots submitted – actually she wanted the difference between peak temperature and mean temperature
* Cathryn: I think these plots are valid and you did the right thing in choosing the time of day with the peak temperature (which is actually 1400LST). Next week it will be worth doing lag correlation analysis for the sea breeze (1 vs 2, 2 vs 3, 1 vs 3) as you have already attempted and then a lag correlation analysis between the sea breeze and temperature for each sector. For the report - I suggest you present on overview of your findings and relate back to the results from my paper i.e. your observational results back up the findings from the model. Hopefully we can look into this a little more with the model next week. As for next summer, we can discuss this next week. You could continue with this project but I was wondering whether it could be better for you to experience something different. It might depend partly on whether you will do the second placement next summer or the summer after (if you choose to do an exchange year or industrial placement - I think you said you were planning this). The dates and/or topic don't need to be decided now though.
* The trend in temperature by MJO Phase is as expected – lower in the wet MJO phases when cloud cover is highest.
* Worked on report and presentation – will finish up the long presentation tomorrow, and check the report. I also need to do the 5-minute cool style presentation for next Tuesday.

**15/9/16 – 24/30 (model data)**

Here are some details to get you going with the model task:

I have already computed the low-level divergence by MJO phase for the model:

/nfs/a90-earceb-rest/Singapore/MJO\_dc/RCM\_12km/matlab/mean\_div\_byMJOphase

Can you check immediately if you have read access to these files? In a shell try doing

cd /nfs/a90-earceb-rest/Singapore/MJO\_dc/RCM\_12km/matlab/mean\_div\_byMJOphase

ls

To check you can see them. Also in matlab try loading one of the files:

load /nfs/a90-earceb-rest/Singapore/MJO\_dc/RCM\_12km/matlab/mean\_div\_byMJOphase/singv\_12km\_div\_MJOphase\_mean1.mat

If you don’t have access let me know and I will get IT to change the permissions.

**Checked – they work fine!**

**About:** These files contain some of the model data from my 2016 paper. I have computed the daily mean low-level wind divergence on a lat/lon grid and have put it into separate files for each MJO phase. e.g. singv\_12km\_div\_MJOphase\_mean1.mat contains 42 days of data (because there were 42 days in DJF between 2000 and 2010 that were in MJO phase 1). The data is in a matlab data structure div\_12km. Within the structure is the divergence data and the time/latitude/longitude dimensions.

**Aim:** It is thought that increased sea breeze strength will increase the convergence (i.e. negative divergence) of low-level air along the coastlines of the islands, which should increase uplift and the likelihood of convection and rainfall. Since we can’t measure convergence it would be good to use the model as a tool to understand if this is the case. My 2016 paper combined with your observations analysis suggests that the model does a reasonable job of reproducing how key processes vary by MJO phase, so hopefully it will do something sensible with the convergence.

**Tasks:** To get familiar with the data I suggest that you firstly write a script to loop through the 8 .mat files in the directory (ignore the netcdf files in there for now), average over the time dimension and plot onto a map.

Here is an example file of how to do contour plots. Copy the script into the place you store your scripts. You will need to change it so that it reads in the matlab data instead of the netcdf files and so that is loops round the 8 MJO phases.

[http://homepages.see.leeds.ac.uk/~earceb/files/for\_Isaac/plot\_singv\_domain.m](http://homepages.see.leeds.ac.uk/~earceb/files/for_Isaac/plot_singv_domain.m" \t "_blank)

I think you have the shoreline data already, but it is here:

[http://homepages.see.leeds.ac.uk/~earceb/files/for\_Isaac/shoreline.mat](http://homepages.see.leeds.ac.uk/~earceb/files/for_Isaac/shoreline.mat" \t "_blank)

2:05pm: Report and presentation stuff sent to CB for now – wait for suggestions

***Some feedback***

Difference between onshore wind and sea breeze (check in report + presentation)

Onshore wind is the rotated wind vector at 1600 LST. This includes the sea breeze and also the large-scale flow

The sea breeze is [rotated wind vector at 1600LST] minus [diurnal mean rotated wind vector]. This removes the influence of the large-scale (i.e. if the prevailing wind was from the west you would have an onshore wind on the West coast of Sumatra even if there was no sea breeze). So subtracting the mean wind brings out the sea breeze component of the wind.

Which one is more useful for our study is debatable as both the sea breeze and the onshore wind will impact the convergence. Make sure it is clear which one you have plotted (I think it probably is already). Eventually it would be good to have plots of both of these.

In my paper both RCM’s show a clear signal in the onshore wind vs MJO phase but RCM4.5 does not show a clear sea breeze signal by MJO phase. This is not because of what is going on in the day time but rather there is some variation at night (this is explained in the paper text).

So therefore what you say on slide 23 is correct.

Powerpoint and script

Overall very well organised and presented slides, showing the right information in the right order.

Slide 1 change to “importance *for* severe weather”

Slide 6 (MJO) you could show Figure 2 from:

[http://envam1.env.uea.ac.uk/mjo.html](http://envam1.env.uea.ac.uk/mjo.html" \t "_blank)

(copy and paste the animation into the powerpoint) to help the audience visualise what is going on – almost all of them will not have heard of the MJO (even the meteorologists)

Slide 8: you could also say (in words) that the sea breeze reverses into a land breeze at night as the land cools down quicker much more than the sea

Slide 17: say that the zeros are likely times when no measurement was actually made (should have been recorded as missing values)

Slide 21: compare means and medians – if they are similar it shows that a small number of very large or small values are not impacting mean, which is good

Slide 25: it is reasonable that the model would underestimate the variability in sea breeze by MJO phase. Models tend to struggle to reproduce the MJO, so it is good they even show a weak signal

Slide 28: very good interpretation in blue in script!

At the end: next week, when you have the final conclusions you could add something about future work.

Report

I think this is fine for now and to hand in. We can have another look at it next week to make sure everything is documented properly before you leave.

**16/9/16 – 25/30**

Printed out presentation script for weekend practice

Cool presentation for Tuesday

Model data tasks from CB

Send Beth slides

Document model plots of div into figures of research

Send CB model plots AND cool presentation slides.

Application for RMET ambassador! That must be done by the weekend. (Give it a go – if it’s not the Lord’s will it doesn’t matter but great if it is at least have a go rather than not try at all!)

**19/9/16 – 26/30**

* Discussion with CB on report, cross correlation, and presentation discussion component. Tasks as of now in dashed bullets:
* Cross correlation – do repetition to get more sensible lag calculation
* Document model\_div onto the figures of research
* Add the severe weather component to short presentation
* Need to do another plot for all 3 sectors on single axes for onshore wind and also the lag correlation – subtract 1000 on y-axis to line them up + correlations also on same axis for BOTH sea breeze and onshore wind.
* Lag correlation also for temperature
* Temperature plots against sea breeze lag correlation – west to west, middle to middle, east to east – does temperature trends correspond to SB? – YES!
* Submission of report – read thru one more time.
* Is the correlation statistically significant? – T-test on MATLAB? – don’t worry about this as CB hasn’t worked on it yet.

***20/9/16 – 27/30***

* Do more divergence plots using a similar script – read ncdf file and plot divergence for 1400 LST (6 UTC) – average over 42 days
* Took awhile and Beth’s help – but now some values exceed the colourbar and show white! This should not be the case – need to get some help, then I can finish up the presentation once and for all!
* Well Cathryn gave me a good for loop to overcome the issue to overcome white in minimums – see MATLAB script – and so it’s done!
* Presentation Questions to consider on Friday:
  1. Clarification for things if not clear
  2. Future work?\* - Discuss on Thursday 1st
  3. Project highlights? – can be seen on Tuesday’s ☺

Last task for today:

* Document model plots, include in presentation, and resend CB the slides and script!
* Then have fun!