**UGRL Scholarship Report – Summer 2016**

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**School of Earth and Environment**

**BSc Meteorology and Climate Science**

**Project title: Characterisation of the sea breeze over Indonesia and its importance on severe weather**

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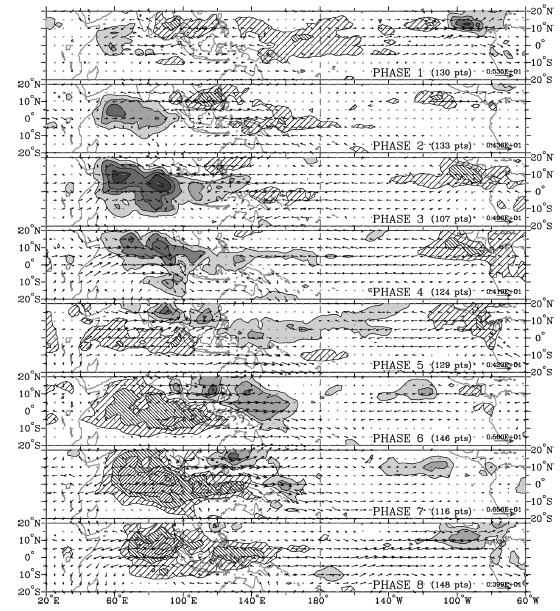
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# Project work highlights

#### Introduction and overview

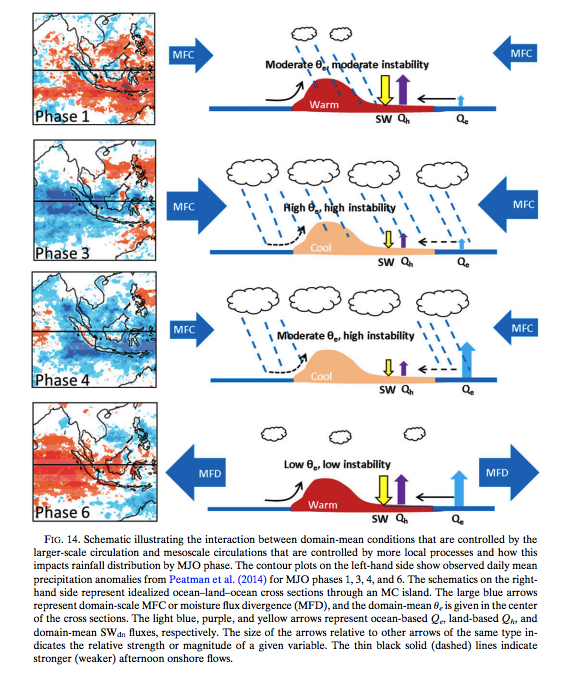
My UGRL research project explores the variation of sea-breeze strength with the larger-scale Madden Julian Oscillation (MJO) and its associated importance on the development of severe weather over the Maritime Continent (MC). The MJO is an important component of intraseasonal variability in the tropics, featuring large-scale eastward propagation of rainfall over a region of warm sea surface temperatures originating over the Indian Ocean and propagating over the MC into the Western Pacific within a 30-90 day period (Birch et al., 2016). Wheeler and Hendon (2004) have divided one MJO cycle into eight distinct phases based on the spatiotemporal distribution of enhanced and suppressed convection (Figure 1).

***Figure 1: Eastward propagation of enhanced convection (dark shading) based on MJO phase (Taken from Fig X, Wheeler and Hendon, 2004).***

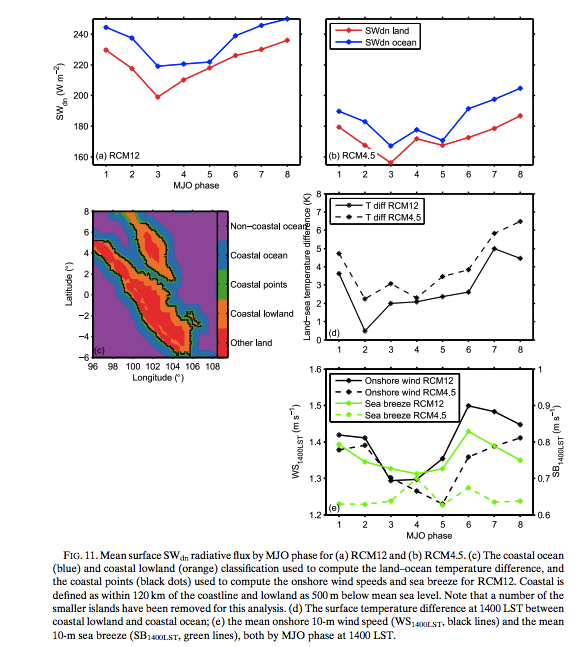


Over the MC, convection is enhanced during phases 3-4 resulting in high instability, and suppressed from phases 6-8 resulting in low instability (Figure 2).

***Figure 2: Convection anomalies over the MC in association with MJO phase (Taken from Figure X, Birch et al., 2016).***



Models from Birch et al. (2016) then explore how sea-breeze (i.e. onshore wind) strength varies and corresponds with MJO phase (Figure 3).



***Figure 3: Correlation between sea-breeze strength and MJO phase using coarse resolution (12km) models (RCM12) and high-resolution (4.5km) models (RCM 4.5) (Birch et al., 2016).***

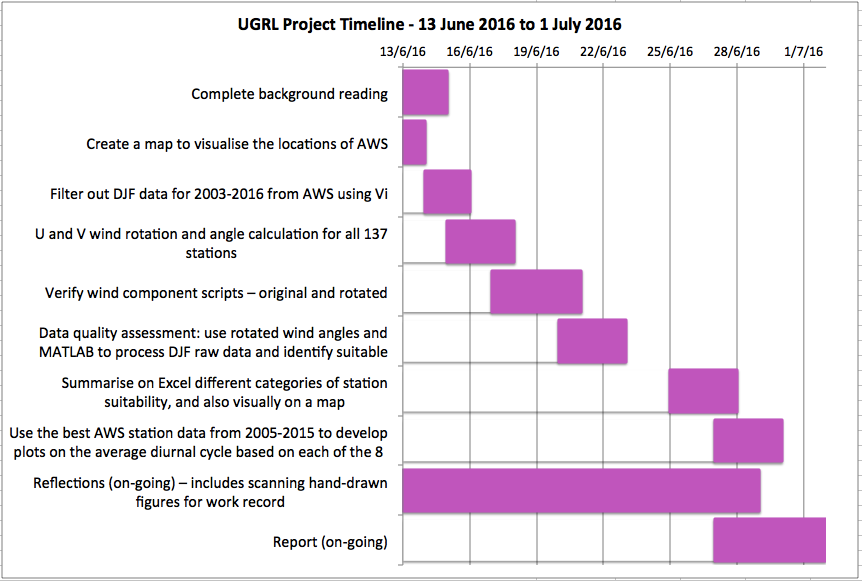
While RCM12 models clearly illustrate that sea-breeze strength is greatest over phase 6 (i.e. suppressed convection over the MC), the RCM4.5 models fail to highlight a distinct interaction between MJO phase and sea breeze. This presents limitations and difficulties in forecasting severe weather in the tropics.

Hence, my research project aims to use data from 137 automatic weather stations (AWSs) within Indonesia (i.e. MC) to characterise this scale interaction between the two atmospheric processes and its importance on severe weather.

(FIGURE 12 FIRST)

#### Project highlights 13 June 2016 to 1 July 2016

During the first three weeks of the UGRL Scholarship project work, I have gained a basic understanding of the syntax and applications of Linux and MATLAB. These, along with knowledge of some simple Vi commands, were essential in processing the large quantities of AWS data within the MC. I have established a clear idea of the overall project goals, and that of this 3-week period (Figure 4). (RESULTS ADDED!)

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***Figure 4: UGRL Project Timeline for the first half of Summer 2016 illustrated in a Gantt chart***

*RESULTS HERE!*

#### Project highlights 2 September 2016 to 23 September 2016

# (WRITE THIS AFTER THE SECOND PERIOD OF SUMMER) – FIG 5 here too with 2nd Gantt Chart

# Skills and knowledge obtained

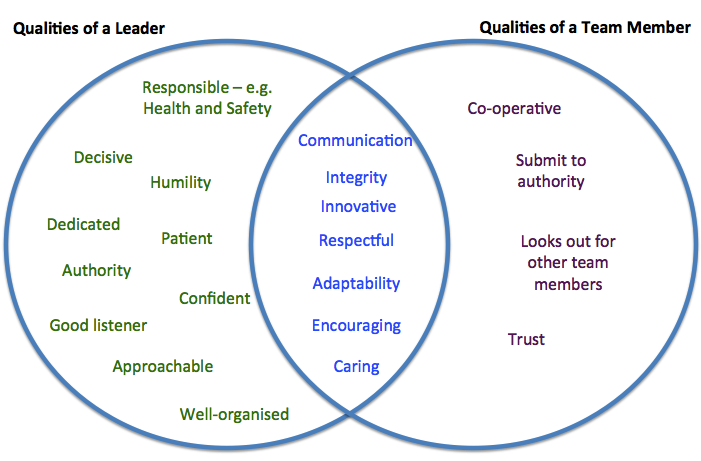
#### Project Work

Regarding my research project, I had the opportunity to extend my knowledge on the meteorological concepts learnt in Semester 2 2016. These relate to atmospheric processes and the basic principles of land/sea-breeze and diurnal cycles (e.g. SOEE 1400 lectures 10-11). Beyond first year meteorology, I gained a sound understanding of the MJO. The overall aim would be to analyse how the larger-scale MJO interacts with the smaller-scale sea breeze to enhance or suppress rainfall in the MC. This would apply the fundamental knowledge to the latest on-going research relating to such meteorological phenomena on a regional, and potentially global scale.

Skills obtained were generally technical and revolved around learning how to use Linux and MATLAB. I learnt and realised that these are essential tools for data analysis and modelling in current and future research.

#### Leadership Training Events

Beyond research skills, leadership training events with the other UGRL scholars at Weetwood hotel (8-9 June) and the Selside Outward Bound (23-24 June) equipped me with knowledge the essential qualities of teamwork and leadership skills (Figure 6) that I was also able to put into practice through practical team-building activities (i.e. wake-up shake-up). Both events enabled me to reflect on which qualities I possess, and those that need improvement.

Soft skills involving communication and project management were also emphasised, particularly during the talks at Weetwood hotel. Beyond team-building activities, I realised the importance of possessing competent presentation skills in terms of communicating my project and research to other stakeholders and audiences. The key messages to take away include:

***Figure 6: Some of the essential qualities in leaders and team members that were discussed during both the Weetwood event and the Selside Outward Bound illustrated in a Venn diagram.***

* Knowledge about my audience I am presenting to.
* Exhibiting authority and enthusiasm on stage – demonstrates confidence.
* Telling a story – beyond just the technical aspects of the research.

Prior to commencing my research project, I was also reminded of some of the skills required in project management. These broadly focused on exploring how project work differs from university coursework in terms of:

* Independence
* Relationship with supervisor
* Discovery of the unknown
* Flexibility to differ from original plan
* Time management – i.e. project stages, project specifications (e.g. technical requirements) and Gantt charts
* Critical thinking – not taking information at face value or analysing benefits and limitations of methods used for the project.

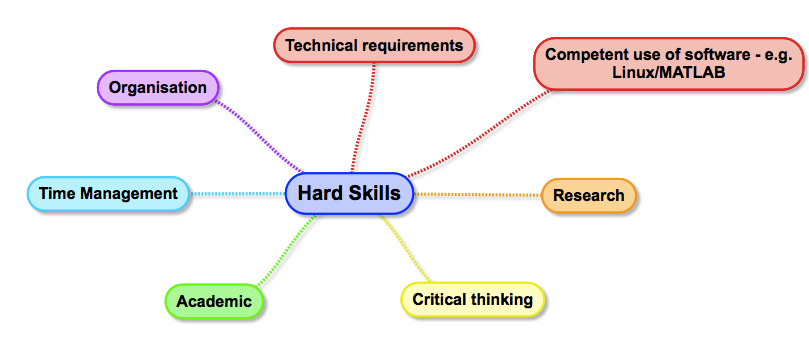
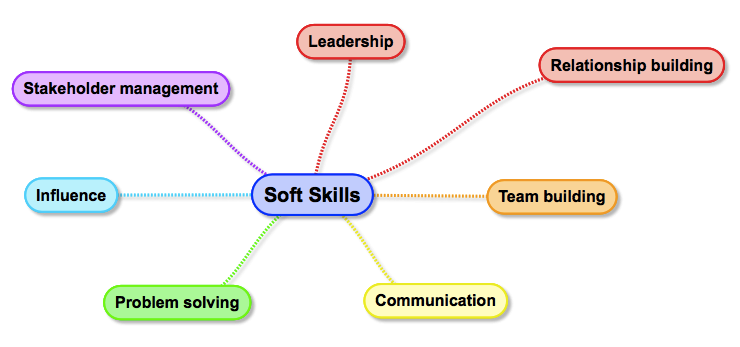
I believe that these skills are important leading up to my final year dissertation.

#### Other Opportunities

**Ambassadorial Duties as a UGRL Scholar**

Other opportunities that fostered my development of the essential soft skills in leadership involved volunteering to help out with events such as the Priestly International Centre for Climate (PICC), and the Centre of Excellence for Modelling Atmosphere and Climate (CEMAC) launch events. Both events involved ushering those attending to the right place, handing out brochures, and taking charge of registration. These events were a means to network with my fellow scholars, other students studying at Leeds over the summer, and my past and prospective lecturers. Getting involved in such activities inspired me to continue making full use of the opportunities available in regards to the scholarship.

#### Summary of hard and soft skills discussed/developed



***Figure 8: Soft skills developed during the UGRL Scholarship leadership training events and ambassadorial duties***

***Figure 7: Hard skills developed during the UGRL Scholarship research period***

# How the UGRL Scholarship has contributed to my career plans

Having been equipped with the relevant research and leadership skills, and engaging in opportunities that involve volunteering and networking, I believe that I have a clearer idea of my future career plans while the skills acquired would increase my employability. After working in an office for 6 weeks, and attending meetings and talks designed for lecturers and post-graduate students, I have embraced the notion of contributing to current research in a professional environment. This also helped me to realise that I would like a career that balances both technical office work, and practical outdoor fieldwork. (COMPLETE AFTER THE LAST 3 WEEKS)

(By the end of the 6 weeks, I’d probably not finished the whole project – so I can’t really say I know whether this is the field for me yet until next year’s report)

**Manchester RMET Conference 4-6 July 2016 – IN DC!**

# References

Birch, C.E., Webster, S., Peatman, S.C., Parker, D.J., Matthews, A.J., Li, Y., and Hassim, M.E.E. 2016. Scale Interactions between the MJO and the Western Maritime Continent. *Journal of Climate*. **29**(7), pp. 2471-2492.

Wheeler, M.C. and Hendon, H.H. 2004. An All-Season Real-Time Multivariate MJO Index: Development of an Index for Monitoring and Prediction. *Monthly Weather Review*. **132**(8), pp. 1917-1932.