Impacts and trend of temperature

* Long term warming (long term temp modelling?)
  + (Glynn 1991)
  + (Hughes et al. 2017)
  + (Hughes et al. 2003)
  + (Pandolfi et al. 2011)
  + (Hoegh-Guldberg & Bruno 2010)
* Coral bleaching (Threshold DHD, heating rate (connected with Reef Temp)
  + Biological and ecological scale?
  + 2015/16 and 2016/17 bleaching events (Hughes et al. 2017 is probably more relevant here)
* Intensity and frequency of heatwaves over short term (intertwined with the bleaching)

Modelling Temperature

* eReefs – process based model that is nested (global<4km<1km, with in these there is a hydrodynamic model < biogeochemical model)
  + detail – go into the specifics of the model?
* ReefTemp – modelling impact of DHD using SST satellite
  + (Maynard et al. 2008)
  + (Garde et al. 2014)
* Satellite algorithms
* Subsurface temperature modelling (but still in reef building zone ~40 m) from SST
  + (Castillo & Lima 2010) – very relevant focused on coral reef making zones
  + (Akbari et al. 2017) – review of sub surface temp modelling but much deep then I wil be focused on eg. up to 2000m
* Generalised additive models (GAM) ??

User guide of schoc

Sciene manual -

Anod portal – stars - trends

Outline/flow of literature review

* Long-term warming patterns and the overall risk/impact to reefs
* short term temperature effects == heatwaves, DHD (increased intensity, frequency and longevity)
* direct impact of heating to coral == bleaching and mortality

the first part will lay out the background information (in detail) and why this work is important to study heatwaves on coral reefs in

* Modelling temperature == the types of model, how they were created and validated
  + eReefs
  + ReefTemp
  + Models used for other reefs
  + Satellite algorithms
* Subsurface == SST and sub-surface temperature predictions
  + Effectiveness
  + How others have adjusted these models

the second part leads closer to my research questions: comparing and creating models for the subsurface

Introduction/definition of subject: The introduction should clearly define the subject of the review, provide relevant background and highlight the significance of the topic. It should include the broad purpose of the review, scope of the review, key definitions of the subject matter, and background information justifying why a review of the topic is necessary. The introduction should finish with a specific set of aims (i.e. research questions) for the review.

Selection of key papers, examples: The degree to which the student uses relevant papers to identify the major contributions and controversies in the field of study. The review should not catalogue all available literature on the topic but select the most relevant findings for particular arguments and select papers that illustrate each point effectively. Wherever possible, the review should focus on recent developments and primary literature sources. All sources should be correctly acknowledged, cited in the text and reference list. The reference list should be complete, accurate and formatted correctly. An appropriate number of sources should be used.

Identification of trends, controversies, etc: The degree to which the student highlights and discusses major research trends and controversies, both recent and past, relevant to the topic in question.

Evaluation of material: An adequate, in-depth and critical evaluation of the topic is required. Effective writing will compare and contrast relevant literature to form a constructive argument regarding the state of the research topic. Key research findings should be compared and discussed with implications for future research indicated. Students should show sufficient grasp of the subject area to critique (with appropriate reasons and evidence) methodology, experimental design and theoretical views of papers reviewed.

Contribution of original ideas: The degree to which the review represents an independent analysis of the topic. Student’s should offer their own interpretation of research trends and provide original ideas as much as possible. The review should also be original in its organisation of ideas (i.e. structure).

Organisation of material: The main body of the review should be structured into sections & sub-sections (with headings) that show an ordered progression of topics. There should a logical development of relevant themes that lead to the paper’s overall argument/s. Organisation of the material should be original and not copy structures of previous review papers.

Use of original figures, tables, etc: Figures and tables should be used to synthesise literature trends, topics and key findings. Original illustrations that compare and summarise research trends and findings across the range of discussed research topics are ideal. All figures and tables should be referred to in the text and formatted to publication quality. Information sources must be accurately represented.

Quality of written text: The fluency, conciseness and clarity of the text. The degree to which grammatically correct sentences, spelling and punctuation are used. The fluency of the writing is also an evaluation of the student’s scientific writing style and the ease with which this can be understood by non-specialist professional readers.

Thoroughness of coverage: The review should be an in-depth treatment of the topic covering key issues and accurately representing sources.

Akbari E, Alavipanah SK, Jeihouni M, Hajeb M, Haase D, Alavipanah S (2017) A Review of Ocean/Sea Subsurface Water Temperature Studies from Remote Sensing and Non-Remote Sensing Methods. Water 9

Castillo KD, Lima FP (2010) Comparison of in situ and satellite-derived (MODIS-Aqua/Terra) methods for assessing temperatures on coral reefs. Limnology and Oceanography-Methods 8:107-117

Garde LA, Spillman CM, Heron SF, Beeden RJ (2014) Reef Temp Next Generation:A new operational system for monitoring reef thermal stress. Journal of Operational Oceanography 7:21-33

Glynn PW (1991) CORAL-REEF BLEACHING IN THE 1980S AND POSSIBLE CONNECTIONS WITH GLOBAL WARMING. Trends in Ecology & Evolution 6:175-179

Hoegh-Guldberg O, Bruno JF (2010) The Impact of Climate Change on the World's Marine Ecosystems. Science 328:1523-1528

Hughes TP, Baird AH, Bellwood DR, Card M, Connolly SR, Folke C, Grosberg R, Hoegh-Guldberg O, Jackson JBC, Kleypas J, Lough JM, Marshall P, Nystrom M, Palumbi SR, Pandolfi JM, Rosen B, Roughgarden J (2003) Climate change, human impacts, and the resilience of coral reefs. Science 301:929-933

Hughes TP, Kerry JT, Alvarez-Noriega M, Alvarez-Romero JG, Anderson KD, Baird AH, Babcock RC, Beger M, Bellwood DR, Berkelmans R, Bridge TC, Butler IR, Byrne M, Cantin NE, Comeau S, Connolly SR, Cumming GS, Dalton SJ, Diaz-Pulido G, Eakin CM, Figueira WF, Gilmour JP, Harrison HB, Heron SF, Hoey AS, Hobbs JPA, Hoogenboom MO, Kennedy EV, Kuo CY, Lough JM, Lowe RJ, Liu G, Cculloch MTM, Malcolm HA, McWilliam MJ, Pandolfi JM, Pears RJ, Pratchett MS, Schoepf V, Simpson T, Skirving WJ, Sommer B, Torda G, Wachenfeld DR, Willis BL, Wilson SK (2017) Global warming and recurrent mass bleaching of corals. Nature 543:373-+

Maynard JA, Turner PJ, Anthony KRN, Baird AH, Berkelmans R, Eakin CM, Johnson J, Marshall PA, Packer GR, Rea A, Willis BL (2008) ReefTemp: An interactive monitoring system for coral bleaching using high-resolution SST and improved stress predictors. Geophysical Research Letters 35

Pandolfi JM, Connolly SR, Marshall DJ, Cohen AL (2011) Projecting Coral Reef Futures Under Global Warming and Ocean Acidification. Science 333:418-422