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Interactive comment on “Characterisation and quantification of regional diurnal SST cycles from SEVIRI” by I. Karagali and J. L. Høyer

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Review (by D.G. Bowers)

The daily cycle of sea surface temperature is driven by daily solar heating and night-time cooling of the ocean. It is important for a number of reasons, including the fact that phytoplankton growth can be stimulated by the stability created by the diurnal thermocline. This paper provides a thorough investigation of the statistics of the diurnal cycle of sea surface temperature (SST) using data from two different satellites (SEVIRI and ENVISAT) and from an array of instrumented buoys. It assumes that the reader knows a bit about these satellites. An important thing to know (not stated, but I guess this is correct) is that SEVIRI is a geostationary satellite, fixed above a chosen point on the earth's surface, and so is able to provide hourly sea surface temperature maps of the

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bit of the ocean it can see, clouds permitting. The paper first makes a comparison of SST measured by the two satellites. This examination involves analysis of large data sets (over 50 million values of SST) and is rather technical, involving various levels of quality control. To a non-specialist, it seems that the two satellites are closely matched in their estimates of SST. The main differences occur in places where atmospheric effects are important. This makes me wonder why the processing of the satellite data to derive SST from the two sensors doesn't use the same physics in making the atmospheric correction. I also wonder about the effects of cloud cover. Presumably, no estimate of SST is available if the ocean is covered by cloud. Are there diurnal variations in cloud cover (perhaps driven by the SST) and does this have any effect on the statistical analysis? It would be good to know how the number of clear sightings varies during the day.

The amplitude and phase of the diurnal cycle of SST are presented as maps of the area covered by the SEVERI satellite and as plots of temperature against time of day in 8 selected areas. I suspect that the last figure (figure 8) will be most referred to by physical oceanographers. This shows the daily cycle of sea surface temperature in different months in the 8 selected regions. The range of the cycle is quite large - over a degree in some places and the maximum temperature occurs at between 2 and 3 o'clock in the afternoon, local time. Minimum temperatures occur at about 4am local time, so the daily cycle is a little asymmetric. This information will be useful to people who model the thermal structure of the ocean. There is no attempt in the discussion of this paper to place the results in the context of the important physics driving the daily cycle.

DETAILED POINTS

1. The presentation of the satellite data (sections 2.1 and 2.2) contains details which are based on current conventions and so will mean nothing in the future when these conventions have changed. Better to stick with statements that have a meaning in plain language if you can. An example is the statement that 'we use measurements

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that have an uncertainty lower than 0.8'. This means nothing to people who don't use this data.

2. The meaning of the last paragraph on page 1098 is not clear to me. I can see how the dawn skin temperature can be taken as the 'foundation' temperature to relate diurnal changes to. Why is it necessary to have refinements on this?

3. I notice on page 1099 that you ignore data if the satellites differ in their temperature measurements by more than 4 standard deviations. I'm sure this isn't really a big issue, but does leaving out the bad data not make your results look better than they actually are? Line 15 on this page, the sentence beginning 'The last row..' should begin 'The last 3 rows..', I think.

4. Page 1101 second line textminus? You are a bit sloppy about describing some of your results. For example, line 13 on this page 'SEVERI before adjustment had a mu of -0.08..'. You are talking about a difference, so you mean 'SEVERI - AATSR...' I think. 5 lines down 'statistics are slightly larger' doesn't mean anything.

5. Page 1102. The start of section 4.2 gave me a headache: ' The averaged statistics for all the TFFs against VF and DTFF, are shown in Table 3'. I had to look back to see what these acronyms meant. Be worth reminding your reader what these values are.

6. Page 1104 Are the numbers shown in figure 4a the total hours (when temperature is above foundation) over 6 years? Be more physically meaningful to give the average number of hours in a day when the temperature is above the dawn value. On page 1105, I'm not sure what figure 4c shows. Is a zero occurrence when $\Delta T > 1$ every day? On line 17 what do you mean by 'insolation $\geq 400 \text{ W/m}^2$ '? Is this daily mean insolation? You introduce SST subscript found at the bottom of this page and I'm not sure you've defined this, although I can guess what it is.

7. Page 1106 first paragraph. Why does the time zone matter (in producing vertical stripes on your map) ? The map shows a difference in temperature. I don't see quite

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why this should jump when you cross a time zone.

8. page 1128 caption to figure 8 should start 'Average daily cycles..' I think.

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