

Review of *The Southern Ocean marine ice record of the early historical, circum-Antarctic voyages of Cook and Bellingshausen* by Grant R. Bigg.

This is a well-written paper that suggests that 200-250 years ago, the ice in the Weddell Sea extended further north than at present. In its present form however, the paper has several issues that must be dealt with before publication.

Although the author cites the Claire Parkinson 1990 paper on the properties of Antarctic sea-ice cover during the same period in his reference list, there is no discussion or citation of her paper in his text. In Parkinson (1990), she used some of the same observations of Cook and Bellingshausen that the author uses in the present paper. She also used observations by Charles Wilkes in 1838–42, and James Clark Ross in 1839–43, which the author does not use, and appears to be the first person to discuss Cook's Weddell-Sea ice tongue.

Parkinson concludes (her abstract) that “When these locations are compared with satellite-derived ice edge locations in the mid 1970s, there is a suggestion of particularly heavy ice covers in the eastern Weddell Sea in December 1772, in the Amundsen Sea in March 1839, and perhaps, on the basis of an isolated observation, in a portion of the western Weddell Sea in January 1820.” These results are sufficiently similar to the author's that they need to be described and commented on. The author then needs to show how his improved data set expands on this work.

Another issue concerns the supplementary data, which are embargoed and thus unavailable to this reviewer. These data must be made available to reviewers before acceptance. Further, please add Bigg (2024) to your reference list.

In the embargoed data set, Lines 139-140 state that the author has recorded iceberg density, as in “For each day iceberg density as noted in the journals and logs was recorded, with ‘0’ denoting no “islands of ice”, ‘1’ if 1 “island of ice” was noted, ‘2’ if a few icebergs were seen, and ‘3’ if an iceberg field was noted. [note that in this sentence, the author should write ‘one’ island of ice, not ‘1.’] However, you don't use this information in Figure 5, and use it without reference to your '1, 2, 3' system in Figure 6. Why not? Please be clear about how you use your data set, on which you have expended a great deal of work.

My feeling is that given the greatly expanded data set which the author developed, that once the problems with the Parkinson reference and work are corrected, his data sets made available to the reviewers, and certain issues about the figures given below are corrected, the paper should be suitable for publication.

Sincerely,

Seelye Martin

Specific concerns:

The Bellingshausen and Cook cruises are almost 50 years apart. Bellingshausen's cruise was part of the 1820 discovery of the Antarctic Peninsula (him, Palmer, Bransfield...), and also about the same time as Weddell's 1823 record setting voyage into the Weddell Sea. Could you use Weddell's data as well?

I applaud your use of Forster's data, and especially of Tobias Furneaux's data, but what about William Wales, the astronomer on the *Endeavor*? From my experience, Wales did a great job, but unfortunately, his journal is only available in handwritten form. Somebody, someday, has got to go through this for the icebergs.

Line 32: Although interesting, your comment about Arctic exploration and Horatio Nelson is not relevant to the argument of your paper.

Line 86-88: what about in the 1840's, when James Ross, Jules Dumont d'Urville, and Charles Wilkes (United States Exploring Expedition of 1838–1842) did their coordinated surveys? Ross, and maybe the others, were part of an international effort to carry out von Humboldt's coordinated study of the Earth's magnetic field.

Line 69, "New Style, see section 2.x for discussion of dating:" Define 'x'.

General question: Are your colors accessible to people who suffer from color-blindness?

Line 115 ff: good discussion of chronometer accuracy.

Line 143: Change "clearly different to 'ice islands'", to "clearly different *from* ice islands."

Line 208, Comiso/Worby comment: Does their systematic error affect your results?

Concerns about Figures

Figure 1: There is a problem with the fish-hook in the green line south of Cape Town, why does this line terminate abruptly?

Figure 2: I find your combination of the colors and symbols confusing, especially since you don't define the colors in either your caption or on the figure. Why not put all your symbol information in your caption?

Figure 3: "An example of summer sea ice concentration in the Southern Ocean, from 31 December 2007." Any particular reason for this choice of date? Am I supposed to compare this figure with Figure 2 above?

Figure 4: In concept, this is a good figure, but in practice, it is extraordinarily difficult to understand. Have you thought about doing it as a polar projection? The mixes of color and symbols here makes it hard to read. For example, the small black x's are defined as Bellingshausen data, but there are no such x's. The black x's are large, and the small x's are purple. Why? You should explain all the colors and symbols in the caption. Further, the light green slightly florescent color tends to fade into the background, can you find a better color? Your data bleeds over the top of the figure, so please extend the figure north. Note that the horizontal and vertical axes should be labeled 'degrees latitude and longitude.' Can you flag the Parkinson ice-tongue anomaly? Is it within bounds? You say in the text (line 216) that it's an east-west anomaly, but I sure don't see it.

Figure 5. Iceberg observations: You show the crosses and the x's for Cook and Bellingshausen on the figure but define the colors in the caption. I'd feel better if you'd either put all explanation in the legend on the figure or in caption. Also, since you have done a great deal of iceberg analysis and sorting into the '1, 2, 3' categories, why not use this information on the figure?

Figure 6. Comparison of modern iceberg distribution from Tournadre et al. (2016) with iceberg observations of Cook and Bellingshausen: Instead of referring to the top panel and bottom panels, why not call these Figures 6a and 6b? Top panel shows all Cook and Bellingshausen iceberg observations; lower panel is where iceberg fields were. I assume that your upper figure shows all of your icebergs, while the lower figure shows your iceberg fields, namely your Category '3' observations. Is this correct?

Figure 7. Comparison of iceberg observations from Cook and Bellingshausen explorations with modern ship-board iceberg observations from Romanov et al. (2017) and Orheim et al. (2023): Need to explain the symbols and need to define crosses and x's. Pattern in Weddell Sea/South Atlantic appears to be shifted east, comments? An interesting thing about this figure is that in the Weddell Sea/South Atlantic, the icebergs and sea ice appears to be shifted east; is this correct?

END