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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Observations of surface momentum exchange over the marginal-ice-zone and recommendations for its parameterization" *by* A. D. Elvidge et al.

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Thank you for your comments, to which we hope our responses and subsequent changes in the manuscript adequately address.

Referee comment #1: p10, line 24: Charnock is not constant because it is sea state dependent. Bidlot et al. 2014 show a nice example, where a wave model was used to calculate Charnock, including areas with sea ice. In that paper, the drag experienced by the atmosphere was shown for all wind conditions for both Arctic and Antarctic combined. For small ice fractions, Cd varies by almost one order of magnitude with a median value of 1.5 10**-3. The mean Charnock was around 0.01 for winds below

5m/s and 0.03 for wind above 18m/s with a linear to quadratic growth in between (Bidlot private communication).

Author response: We agree that the consent seems to be the Charnock 'constant' is not actually a constant, but is related in some way to the wave field, although the details are still under debate. In any case, in our case studies the flow was always off the ice edge, so wave development was minimal. Consequently waves are not significantly affecting our results.

Referee comment #2: P15, line 22: COARE 4 is a better reference Edson, J., V. Jampana, R. Weller, S. P. Bigorre, A. J. Plueddemann, C. W. Fairall, S. D. Miller, L. Mahrt, D. Vickers, and H. Hersbach (2013), On the exchange of momentum over the open ocean, J. Phys. Oceanogr., 43, 1589–1610, doi:10.1175/JPO-D-12-0173.1.

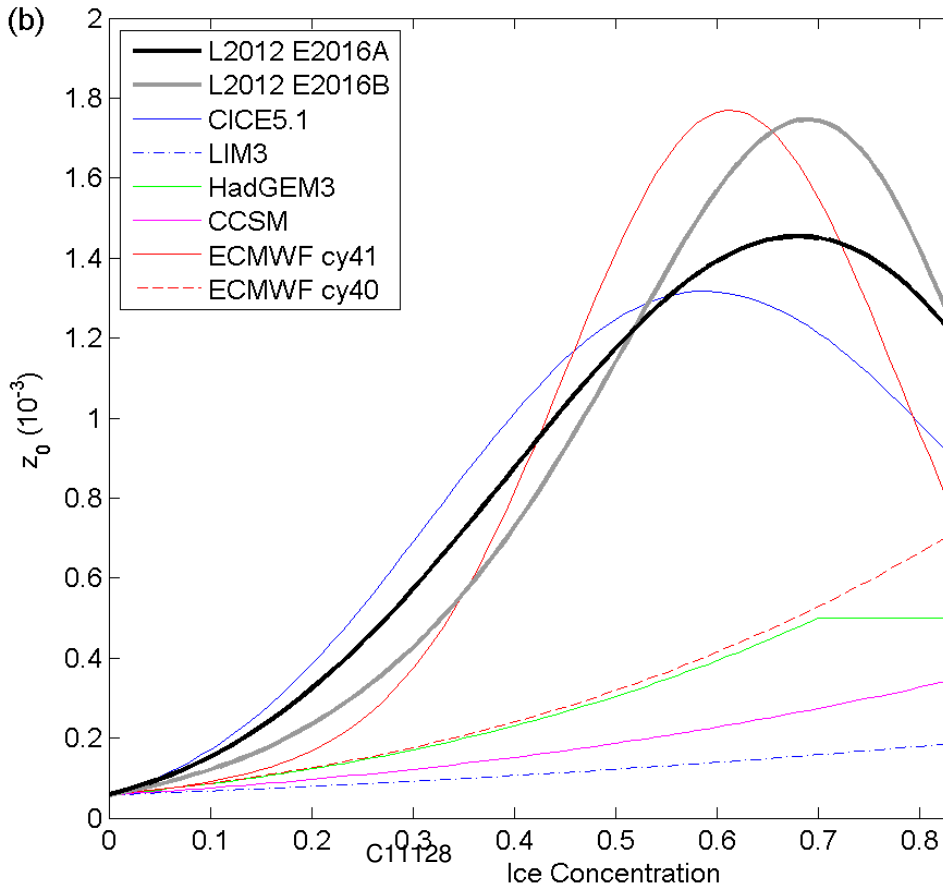
Author response: For logistical reasons, we used COARE version 3 rather than 4. Since the use of COARE here is not a particularly important part of the paper, we don't believe this is worth changing.

Referee comment #3: Would it have been possible to analyse the data to also present a parameterisation for z0 in terms of sea ice cover as presented for ECMWF. Weather models tend to represent the surface properties in terms of roughness length scale.

Author response: We agree, such a figure would be useful to some readers.

Author's changes in manuscript: and have added a new plot (Fig. 10b - see figure attachment to this response) showing effective z0 against sea ice concentration, with effective z0 derived from effective CDN10 (as shown now in Fig. 10a).

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 26609, 2015.


(b)
L2012 E2016A
L2012 E2016B
CICE5.1
LIM3
HadGEM3
CCSM
ECMWF cy41
ECMWF cy40
z_0 (10^{-3})
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
Ice Concentration