Ocean Sci. Discuss., 11, C1153–C1155, 2014
www.ocean-sci-discuss.net/11/C1153/2014/

Ocean Science Discussions
Open Access

Interactive comment on "Tidal forcing, energetics, and mixing near the Yermak Plateau" *by* I. Fer et al.

Anonymous Referee #2

Received and published: 11 December 2014

Review of Fer et al., Tidal forcing, energetics, and mixing near the Yermak Plateau

The paper describes the analysis of the tidal signal contained in measurements at 5 stations, each lasting about a day, and in short-term mooring. The analysis of a coarse model complements the data.

The Yermak Plateau lies north of the critical latitudes of both M2 and K1 - internal waves at the tidal frequencies cannot propagate freely. This is acknowledged in the paper, but never really discussed or taken into account. The barotropic tides are relatively large, and they do interact with topography. The baroclinic motions created are NOT internal tides, as internal waves at the tidal frequencies are commonly referred to. They are evanescent. I am really not sure that the "accepted" way to calculate energy flux <pu> works when omega < f... The energy does not propagate away âĂŤ horizontal group speed is zero (or imaginary) - the wave is trapped by topography. What is the meaning

Full Screen / Esc
Printer-friendly Version
Interactive Discussion
Discussion Paper

of these quantities, then? <p'u'> is not E*c_g. The authors do refer to "shelf waves" on page 2261, but not much is discussed. The significance of the "baroclinic energy fluxes" really has to be better addressed, both for the model and for the observations.

In that spirit, results from the paper are generally compared with lower latitudes - Hawaii, Luzon, etc. In these location, internal tides are free waves and can propagate way. One of the major results of the paper, according to the abstract, is (almost???) all the barotropic-baroclinic conversion is dissipated locally. Of course! I find it surprising (suspicious?) that calculations show any energy flux at all! I don't understand that.

p2249 L10: Please rephrase, this sentence is either wrong (the Arctic doesn't have tidal velocities of 5-10 cm/se everywhere), or misleading. Why would the results not be relevant for a place where tidal velocities are 4 cm/s? What are the results? That energy is trapped and has to dissipate locally? That would be true for any velocities.

p2250 L25: "model implicitely resolves"... What does that mean? Mesoscale and internal waves are on very different time and spatial scales, it seems strange to lump them together.

Section 3.1 - This has to include some mention of the fact that the dispersion relation doesn't hold here... omega < f, so horizontal wavenumber is imaginary (evanescent). What does that mean for the "energy flux"? What is the divergence of that quantity? I'm confused.

p2259 L5: But the internal tide can propagate away in these places! The Yermak Plateau is different! p2260 L6: There is no radiation! Baroclinic motions at the tidal frequencies would be trapped waves, not free waves.

p2260 L25: Don't you expect epsilon to grow as you approach the bottom? So, epsilon_max is an under estimate, when you don't reach the bottom (most cases). It is not an upper-bound.

p2261 L8: "a typical poleward flux". Typical of what? Barotropic tides are large (plane-

OSD

11, C1153–C1155, 2014

tary) waves that can propagate in any direction - it depends on the basin shape. Also, the semidiurnal fluxes look just as divergent as the diurnal ones. . .

p2261 L16: Shelf waves that propagate “freely”? Don’t they need a shelf? Again, the values that are used to compare the results are all south of critical latitudes.

p2262 L12: “negative conversion. . . indicates interactions between locally and remotely generated baroclinic tides”: But these waves cannot have come from somewhere else - they can’t propagate! How do you explain negative conversion rates?

p2263 L23: What do you do about places where the conversion rate is negative? Why is dissipation always positive, yet C has both signs?

p2266 L6-7: You mean the semidiurnal HEK + APE, right?

p2266 L10-20: I find this paragraph confusing - what is the point here?

p2267 L12: “within the range inferred from observations”. . . You are being generous. There are only 5 points in a very variable field. The extrapolation to the bottom is sketchy, and the 10% fraction being “hotspots” seems very arbitrary. From these observations, you could really get any answer you want. . .

p2268 L2: So, if you said that it happened over a slighty thicker layer (300m), you would get half the heat flux, right? Hmmm.

p2269 L1: I note that you don’t need a critical slope to generate internal tides, or trapped waves.

Interactive comment on Ocean Sci. Discuss., 11, 2245, 2014.