

## ***Interactive comment on “Mapping turbidity currents using seismic oceanography” by E. A. Vsemirnova and R. W. Hobbs***

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Vsemirnova and Hobbs' analysis shows very clearly that the deep reflector in their figure 2 is due to a boundary in suspended sediment concentration. Their careful analysis of reflection amplitude (we think the histogram approach in figure 5 is a brilliant idea) and innovative comparison with optical backscatter observations demonstrate the potential for seismic imaging to quantitatively map suspended sediments in the water column.

The authors call the associated layer a "turbidity current", which is normally defined as a density-driven, sediment laden downslope flow – i.e. driven downslope by the sediment load. However, turbidity currents are normally transient phenomena, requiring a suspension event to initiate the current, and the odds of capturing such an event in any

C714

given survey are likely not high.

Another, possibly more likely, interpretation of the reflector is that it images the boundary of a turbid layer (i.e., sediment-laden layer), and that the sediment in this layer has been suspended by the along-channel current associated with the deep overflow, as described in paragraph 2, section 2 of this manuscript. Such flows, and the associated sediment suspension, are much less transient phenomena than turbidity currents, and are therefore more likely to be observed in multiple non-coincident data sets, as are shown in V. and Hobbs. Since the dynamical mechanisms that force the current and suspend the sediment have not been proven, and since there are two distinct possible mechanisms (gravity current or deep overflow current), we suggest that the term "turbidity current" be replaced with "turbidity layer".

Notwithstanding the above comment, it is only fair to point out that a quick estimate of the maximum expected speed of the hypothesized turbidity current is  $(g'd)^{0.5}$ , where  $g' = g \cdot \Delta\rho/\rho$  (reduced gravity) and  $d \sim 100$  m is the thickness of the turbid layer. Taking  $\Delta\rho$  as 0.04 kg/m<sup>3</sup>, we obtain an estimated speed of approximately 0.2 m/s, similar to the overflow velocity of 0.25 m/s from Bonnin et al. Therefore, the sediment load is sufficient to drive a moderately strong gravity current, and one cannot exclude that possibility.

Minor clarity questions.

1. In figure 2d and 2e, the red and blue curves should come together near the top of the insets (i.e., 700m) because the sediment concentration approaches zero at or above that depth. This is not the case. Can you explain why not? Perhaps it is related to the OBS calibration in which a background voltage of about 0.02 V occurs even in regions with no sediment (figure 2c). You of course must be sure to subtract the baseline voltage before computing sediment concentration.

2. Could you calculate the amplitude ratio between the reflections generated by thermal contrasts (500 m) and the ones generated by the suspended material in both

C715

synthetic and real data. In the seismic profile, amplitudes seem quite similar, however in the synthetic seismogram amplitudes are at least one order of magnitude smaller.

3. Have you processed more data in this area? If positive, is it possible to observe similar deep reflectors? This could help discriminating between transient turbidity currents and more steady turbidity layers.

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