Ocean Sci. Discuss.,
https://doi.org/10.5194/os-2018-66-RC2, 2018

Ocean Science
Discussions

Interactive comment on "Buoyancy-driven effects on turbulent diffusivity induced by a river plume in the southern Brazilian shelf" *by* Rafael André Ávila and Paulo H. R. Calil

Anonymous Referee #2

Received and published: 26 July 2018

This paper presents the results of hydrographic and turbulence measurements obtained along three transects off the southern coast of Brazil in the La Plata River plume region. Overall, the manuscript provides an interesting data set from a region that has not been well sampled in the past. Thus, the data alone are a significant contribution. The plume exits the La Plata river estuary and turns north due to Coriolis along the coast, in a pattern typical of large scale, far-field plumes. In this regard, the authors would be advised to compare the La Plata plume to similar plumes, such as the Chesapeake, or Delaware plumes, where significant recent work has been conducted. The authors conclude that the presence of the plume water, and the resulting stratification, reduces vertical mixing within the mixing within the plume, and the presence

of increasingly aged/mixed plume water at the transect furthest to the north, both expected conclusions. However, I encourage the authors to push further with the data to quantify more detailed aspects of the La Plata plume evolution. In summary, I believe the manuscript will ultimately be worthy of publication, but recommend major revisions to strengthen the scientific contribution of the work. A series of specific notes and comments follows:

Page 2, Line 2: Please explain the mechanisms by which increased frontal mixing results from plume deceleration in the mid-field region.

Page 3, Line 14: Ultimately, Rig is estimated strictly from density data by utilizing the thermal wind balance relationship. It would be instructive to include a revised equation for Rig based strictly on rho (i.e., combining the equation shown with the thermal wind balance equation). It should be noted, that this approach is not likely to provide enough resolution to use Rig as a diagnostic tool in evaluating the turbulent field. However, it may provide a useful context for the overall hydrography, but a clear representation of the fact that your Rig is approximated using thermal wind balance assumptions is necessary, which would be the result of representing the equation as suggested.

Page 12, Line 14 – Page 13, Line 2: I do not follow the argument that the presence of a baroclinic jet leads to the conclusion of a mid-field region. As described in Horner-Devine et al (2015) the mid-field region represents the transition from a non-geostrophic near-field to fully geostrophic far-field. Please clarify the intent in this section, and revise as necessary.

Section 3: As mentioned above, the manuscript could be improved by adding an additional sub section to Section 3, or a new section 4 for Analysis and Discussion. Most notably it appears that the two transects at opposing ends of the La Plata plume could be used (with some assumptions) to make some generalizations about La Plata plume evolution, including length/time scales for the erosion of stratification and the increase of mixing, allowing the ability for some comparisons with other similar plumes, such as

the Chesapeake and/or Delaware.

Interactive comment on Ocean Sci. Discuss., https://doi.org/10.5194/os-2018-66, 2018.