Response to the comments done by Dr. F. Ardhuin

Dear colleagues, In such a broad review it is difficult to be accurate on each single aspect, and I generally commend the authors for their work. Here are a few ideas about section "2.2 Ageostrophic currents: wind and waves" that the authors may find relevant to incorporate.

1) Writing equation (5) without defining the "total velocity field" is a bit hard. In fact, this form of the equation was first used by Jenkins (Deut. Hydr. Zeit. 1989), and he defined v0 as the quasi-Eulerian velocity, i.e. the Lagrangian mean velocity minus the Stokes drift.
Indeed it is customary to average the momentum equations over the phase of wind- waves that have periods shorter than 30 s, and it is the residual wave motion known as Stokes drift (Stokes 1847) that appears in the tracer transport equation and some forms of the momentum equations (see Lane et al. JPO 2008, Bennis et al. Ocean Modelling 2011).

We have modified the text and we have clarified this point in the new version

2) the role of the Stokes x Coriolis term of eq. (5) has been discussed in the litterature and it may be interesting to note the paper by Rascle and Ardhuin (JGR 2009) in which, contrary to Polton et al. (2005), a realistic time-evolving wave field and stratification was taken into account to interpret the upper ocean currents recorded in the LOTUS3 experiment.

We have rewritten this point and we have included a reference to paper by Ardhuin et al (JGR 2009).

3) Mentioning equation 12 is a disgrace. Monochromatic waves do not exist in the ocean and we know that for random waves the Stokes drift is the sum over the wave spectrum (Kenyon 1969), giving very different surface values, not just profile. In practice a simplified parameterization as a function of wind speed and wave height can be found in appendix C of Ardhuin et al. (JPO 2009), and the surface Stokes drift is generally of the order of 1 to 1.4 times the wind speed.

We agree with Dr. Ardhuin that a monochromatic wave is an idealization. Nevertheless, due its simplicity and its use for some applications we have decided to maintain it. However, we have followed the suggestions of Dr. Ardhuin and we have included the proposed reference and we have underlined the importance of taking into account the full spectrum of waves.

4) Indeed, as stated on line 20, wave models may be a good source of Stokes drift estimates, but these estimates vary widely with model parameterizations (again see Figure in appendix C of Ardhuin et al. JPO 2009, and also Figure 6 and Table 2 in Rascle and Ardhuin, Ocean Modelling 2013).

We have included this point in the new version of the paper as well as the proposed references.

5) It could be mentionned about HF radars, that these radar-derived currents do contain most of the Stokes drift (broche et al. 1983, see also Ardhuin et al, JPO 2009). Just like any surface tracer, even SST (Chevalier et al. RSE 2014, http://dx.doi.org/10.1016/j.rse.2013.07.038).
References: Memo. 509, ECMWF, 29 pp. Broche, P., J. C. de Maistre, and P. Forget, 1983: Mesure par radar décamétrique cohérent des courants superficiels engendrés par le vent. Oceanol. Acta, 6, 43–53.
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This point has been included in the new version of the paper. Based on the existing literature we have seen that it is still an open debate. For example, it has been suggested that HF radar currents include the entire wave-induced Stokes drift (Graber et al., 1997), part of it (Ardhuin et al., 2009) or none of it (Röhrs and Christensen, 2015).