Comments and responses

Line 1: Consider a slightly edited title:

Dynamics of shallow wakes: Data set from field experiments on the Tagliamento River, Italy

Response: Although the suggested change provides a transparent geographical link, we think it might be confusing and the original title is more precise. It is stated in the text that the experimental field site is located on a nameless side branch of the Tagliamento, which has a spring source and during the experiments is not hydraulically linked to the main flow of the Tagliamento. This is important because the flow in the experimental branch is not experiencing the large-scale fluctuations. Furthermore, because of general simplicity of the flow in the experimental setup, the experiments are referring to general situations of flow on gravel bed floodplains and their results are relevant for such systems rather than only for the Tagliamento River.

Line 11: Change "riverbed" to "channel"

Response: corrected

Line 13: Change "present in laboratory studies" to "unavoidable in laboratory studies"

Response: corrected

Line 21: Change "control of the approaching velocity" to "control of the approach velocity"

Response: corrected

Line 30: Change "Turbulent flows…" to "Flow patterns…"

Response: corrected

Line 35: "…the flow and the wake are both referred to as shallow" - I would add a reference to support this criterion.

Response: The threshold value of 0.2 defining narrow open-channel is discussed by Nezu and Nakagawa (1993, p. 111). This criterion is considering the effect of side-walls, which can affect flow in addition to the friction on the bed. Thereby theoretically this is the upper limit for flow shallowness, though for most of shallow flows this ratio is much smaller. For instance, for the dippiest river of the world, the Congo River (h=100 m, B= 2000 m), this ratio is 4 times smaller (0.05) and is close to that in our experiments (0.035). The geometrical

criterion is quite rough and the effect of bed friction on large-scale turbulent structures should be accounted as discussed in the text of that paragraph. We have added the reference.

Line 36: Change "…thereby a shallow wake is the primary flow prototype" to "therefore shallow wakes are typical patterns"
Response: corrected

Line 37: "…h is the mean flow depth and υ is the kinematic viscosity" – I would delete 'the' here
Response: corrected

Line 41: "vortical structures with horizontal axes of rotation" – change to "three-dimensional vortical structures". I edited here as real small scale structures tend to be isotropic and therefore do not have preferential orientation.
Response: corrected as suggested

Line 42: Change "shallow flows" to "shallow wakes"
Response: corrected

Line 44: Change "form in natural rivers" to "in natural rivers are formed"
Response: we have modified the paragraph and this combination of words is not present in the updated version

Line 45: Change "include" to "exhibit an additional feature, i.e.,"
Response: corrected

Lines 49-53: The proposed classification is very appealing. However, the threshold values of solidity separating three regimes in general may depend on the internal geometry of 'voids'. A brief clarifying sentence would be useful here, at least it should be mentioned that the proposed threshold values correspond to the assemblages of emerging vertical cylinders.
Response: we have specified in the text that current threshold values were identified for assemblages of emerging vertical cylinders.

Page 2, line 2 after Figure 1: Change “effects of spatial inhomogeneity” to “effects of small-scale spatial inhomogeneity”. I added 'small-scale' as at scales l within the range D>>l>>d the flow is 'homogeneous', in terms of spatially averaged quantities.
Response: corrected

Page 2, line 3 after Figure 1: “fractional porosity” - Consider 'solidity' as 'fractional porosity' may be confusing.
Response: we changed “fractional porosity” to “solid volume fraction”. Such definition was also used in the abstract of the manuscript.

Page 2, line 5 after Figure 1: “verification of the up-scale effects” – change to “evaluation of scale”.
Response: corrected

Line 67: Change “eco-hydraulic” to “eco-hydraulics”
Response: corrected

Line 76: Change “observe” to “to properly reproduce”
Response: corrected

Line 81: “with an average total annual runoff about 4.73 km^3 at Pinzano” - It is somewhat unusual quantity to characterize the flow. Why not to use annual mean flow rate? It would be more meaningful in the context of this work, in my opinion.
Response: Thanks for the suggestion. We are not aware of accessible literature sources in English with such information. However, we added information on average discharge at Pioverno, located about 30 km upstream: *The hydrologic regime of the river is flashy pluvio-nival with an average total annual runoff about 4.73 km3 at Pinzano and average discharge of ca. 90 $m^3 s^{-1}$ at Pioverno (30 km upstream of Pinzano) (Tockner et al., 2003).*

Line 88: Change “A side branch“ to “Tagliamento branch”
Response: corrected as “Tagliamento side branch”

Line 90: Change “river” to “channel”
Response: corrected

Line 93: Change “bad” to “bar”

Response: corrected as “bed surface”

Line 95: Change “of the side branch” to “of this side branch”

Response: corrected

Figure 2: III is a needle weir

Response: corrected

Line 111: Delete “results of”

Response: corrected

Line 117: Change “case examined in the most detail as part of” “most studied case in”

Response: corrected

Figure 3: Please comment on the potential effects of the floats on the measured flow characteristics. Would it be possible to keep the floats outside the flume, just behind side walls?

Response: we have specified in the text that during measurements left side float was placed outside of the flume ensuring that effect on flow measurements was eliminated. In addition, we have specified that during measurements floating platform was at a fixed position.

Line 137: “custom-built floats made of steel” - Please comment on the potential effects of the floats on the measured flow characteristics. Would it be possible to keep the floats outside the flume, just behind side walls?

Response: potential effect of floats was eliminated, see previous comment.

Figure 4: Superb set up. Very impressive. I wonder if floats could be arranged outside the flume?

Response: thanks for the comment. We have specified that left side float was placed outside of the flume during measurements. Within the current setup it was not possible to place both floats outside of the flume as length of lateral platform in this case would not be sufficient.

Line 150: Consider adding one-two sentences at the end of this subsection outlining sampling errors for key characteristics which are based on the velocity measurements and which are included in the data base.

Response: We have added the following sentence: "…These sampling strategies of the measurement program ensured that key characteristics based on velocity measurements were estimated with the accuracy ranging from 3 to 5% of their nominal values (Sukhodolov and Uijttewaal, 2010; MacVicar and Sukhodolov, 2019). "

These estimates include the contribution of acoustic noise, which is about 2-3% and contribution of long-term fluctuations related to variability of hydraulic regime of the stream. The estimates of the impact of acoustic noise are completed using the method of selective integration of the turbulence spectrum implemented in the ExploreV software.

Lines 157-158: "…each lateral transect included 14 sampling locations evenly spaced across the flow at 0.35 m intervals from the centreline towards the left wall of the flume" - Not clear. In line 144 you specified that the distance between Vectrinos was 70 cm. Also, Fig. 4a shows a different set up. Please clarify.

Response: we have clarified current issue as follows:

Within each lateral transect measurements were performed in two sets. In the first set, the first sensor on the platform was aligned with the centerline of the flume. In the second set, platform was shifted 0.35 m to the left side of the flume.

Line 164: Change "three dimensional velocities" to "velocity vectors"

Response: corrected

Line 169: "the sampling rates were reduced to 10 Hz to avoid spikes in the records" - I think, the presence of spikes is 'masked' (or 'smoothed') by the reduced sampling frequency rather than fully avoided. Please check.

Response: We agree that it is not possible to fully avoid spikes. We have corrected the respective sentence as follows:

However, at some locations, especially in the zones of high flow instability behind the dowels, the sampling rates were reduced to 10 Hz to reduce possible spikes in the records.

Line 179: Change “around” to “in the vicinity of”

Response: corrected

Line 180: Change “high” to “significant”

Response: corrected

Line 199: Please add information in this section on the bulk Reynolds number, Froude number, and friction factor for the approach flow.

Response: information was added as follows:

Hydraulic parameters for the approach flow for 0.1 m/s and 0.3 m/s approach were: $Re_{0.1}=0.32\times10^{-5}$ and $Re_{0.3}=0.95\times10^{-5}$, $Fr_{0.1}=0.05$ and $Fr_{0.3}=0.16$, $c_{f0.1}=0.01$ and $c_{f0.3}=0.02$.

Line 203: Change “3 months“ to „three-month”

Response: corrected

Line 203: Change “Hydraulic” to “The hydraulic”

Response: corrected

Line 206: Change “in their” to “in terms of”

Response: corrected

Line 211: Change “patterns” to “characteristics”

Response: corrected

Line 213: Change “with” to “to”

Response: corrected

Line 225: Change “are” to “become”

Response: corrected

Line 225: Change “of” to “exceeding”

Response: corrected

Line 230: Delete “of”

Response: corrected

Line 231: Change “120 s” to “120 s long”

Response: corrected

Line 260, Table 2: Units for stresses should be squared. Please correct.

Response: corrected

Line 261: “$\overline{u'}$, $\overline{v'}$ and $\overline{w'}$“ - Please consider changing symbols here as conventionally these three quantities are zero if we follow standard definitions.

Response: thanks for the comment, we have corrected this in the manuscript as follows: σ_u, σ_v, σ_w , specifying that $\sigma_u = \sqrt{\overline{u'^2}}$ etc.

Line 263: “…along the streamwise, lateral, and vertical directions respectively“ - delete as this text is confusing, i.e., it is not clear momentum of what components you are writing here about.

Response: corrected