Comments on paper by Singh *et al.* (for JFM Rapids)

Linear stability analysis for *monami* in a submerged sea grass bed

In this paper the authors consider a simple model for a vegetated channel flow and analyse the resulting velocity profile on the basis of a modified Orr-Sommerfeld equation containing both a viscous (Reynolds number) term and a term representing the drag of the vegetated layer at the bottom of the channel. They compare some experimental data from an earlier paper from Nepf's group with the implications of their theory and, *via* a detailed analysis of the instability, conclude (perhaps not surprisingly) that it differs from traditional KH instability because of the presence of this vegetated drag force.

The major assumption in the analysis is that the flow across the entire channel is characterized by a fixed eddy viscosity (invariant with height). This must be far from its actual behaviour in the field, but the authors consider the implications of this very simple turbulence model and suggest that qualitatively the nature of the instability characteristics would be preserved whatever model was used.

The paper is not uninteresting, but the authors should address the following points in order to make it more publishable.

1. p.1 Fig.1 requires attention. The legend needs to be repositioned for greater clarity (perhaps to the left of the velocity profile).

2. p.2, +6 'fitted using the experimental observations.

3. p.3, +4 I think $\boldsymbol{x}$ (hat) needs to be defined here (the unit vector?).

4. p.3, §3 It's not quite clear to me how (3.1) leads to $U(y)$=const. below $y=h_g$. I note (from what follows on p.4) that the shear stress (i.e. $U'(y)$ presumably) is matched from upper and lower layers, but this seems insufficient. A little more explanation here would be helpful.

5. p.4, +1,2 On a related point, why does 'continuity of shear stresses result in a boundary layer of thickness δ'? No natural scale (δ) arises from the solution of (3.1) does it? I cannot see qualitatively what distinguishes this 'boundary layer' from the entire 'shear layer' (indeed, the authors suggest that they are in fact analogous). The layer is (looking at fig.1) much less well defined than, say, the strong shear layer just above an urban canopy, where the velocity gradient is clearly very much greater than in the boundary layer above or the canopy below.

6. p.4, +9 It would be better to say 'the shear layer discussed by Ghisalberti & Nepf, (2002, 2004)'.

7. p.5, +10,11 Although experimentally observed wavelengths are not available, they do arise from the analysis presumably, so some comment about the values and whether they seem physically realistic (and/or how they compare

with the scales of the typical vortex motions in the turbulent flow above the canopy which are believed to be linked with *monami*) would be instructive.

8. p.4, §4 The final sentence, if I understand this correctly, implies that all the available data suggests that only mode 1 (i.e. only the left hand panels in fig.4) is actually relevant to real situations. On the other hand, the statement at the bottom on p.7 (mode 2 is distinct from KH), and the conclusions, seem together to imply that the observed *monami* are mode 2. I became confused at this point and would welcome greater clarity.

   And if mode 2 is not observed in experiments, the extended analysis of its character is perhaps not particularly relevant and should be shortened.

9. p.4, +8 It's not clear how a boundary layer thickness can be equated to a velocity ratio! This comment also appears in the caption of fig.1.

   Furthermore, the caption states that the profile is from Ghislaberti & Nepf – case I. This case has H=12.3 cm and h_g=9 cm and the caption says that δ = 5.02 cm. This implies an H/δ rather lower than any of the experimental data shown in fig.2 (left), which seems inconsistent.

10. p.5, -9 'boundary layer, the' (i.e. singular).

11. Figs.2 & 3 In both captions a value for the eddy viscosity is given. Was there any physical basis for this value? If not, how was it chosen? And how critical are the comparisons between theory and experiment to its value?