Review for WES of
Estimating the wake deflection downstream of a wind turbine in different atmospheric stabilities.
By Vollmer et al

The paper sets out to address by means of LES the effect of wind turbine yaw on the deflection of a turbine wake in three types of wind: neutral, stable and convective. The deliberate deflection of wakes as a means of reducing adverse affects on downwind turbines is of practical interest. The paper presents interesting results which deserve to be published once some improvements to the manuscript are made, as outlined below.

Page 1
Authors and affiliations - why superscript 1 in each?
L9 "Uncertainty in the"
L11 'increases with decreasing stability' Does this mean 'increases with increasing stability (from unstable to stable)'?
L17 "can have a significant .. 10-15 rotor diameters or more downstream"
L23 'The latter'

Page 2
L18 'even suggested considering' But, what is the sentence saying anyway?
L30 'influence of atmos stability on the control mechanisms themselves' This seems an odd way of putting it. - the issues is how the control would need to change with the change of wind conditions as influenced by stability. There is no influence on the control mechanisms as such.

This brief review refers to stability effects as observed from field measurements and computations. There has also been recent work via laboratory stratified flow wind tunnel experiments - e.g. in Boundary-Layer Met.: Chamorro, Hancock and co-workers. On meandering there has been work by Aubrun and co-workers in J Wind Engin and Ind Aerodyn. These could be mentioned too.

Figure 1 is confusing. With yaw there is only one change; the hub axis with respect to a reference mean wind direction - at say hub height. Fig 1a is sufficient, Fig 1b is not needed and adds confusion. Fig 1a is sufficient when there is wind veer. Also, the yaw as shown in the fig is negative. Perhaps this should be mentioned in the figure caption, or the figure redrawn with positive yaw illustrated. (Is there consistency in sign of yaw angle as used later in the paper?)

Page 3
Section 2.1
This seems unnecessarily complicated. At any instant, t, there will be a velocity profile U(t, y) at given x. Over a short time internal Δt, there will be an short-period averaged profile U'(t, Δt, y)), which will vary with t, except when Δt is very long in which case the profile will no longer be a function of t. U'(t, Δt, y)), for given t, will vary with x, and so can be used to define the wake (for that t and Δt). The long-term average – ie large Δt – will define a mean

position varying with x. The short-term average will be a variation about this, but it does not make sense to refer to this as an error. The variation about the steady state is important is important as far as any downwind turbine is concerned.

Page 4
Section 2.3
It seems slightly odd to use wake profile forms that are 'symmetrical' when the results, as might be anticipated (and are) clearly not symmetrical. Could other measures be used? Short period averaged-centre as defined by a velocity minimum, and wake half width?

Page 5
Section 2.4
L11. With no wind turbine present there may be a reasonable strong correlation between the x1 and x2 stations – Taylor's hypothesis would be approximately valid. But a turbine largely destroys the correlation.

Page 6
L 11 Why mention of humidity? This is an added complication if this is being modelled too.

Section 2.7
Mesh size of 5m seems very large. Surely, this should say, Δx, Δy, Δz, rather than just Δx?

Section 2.8
L31. Shouldn't the points made here be made in section 2.7?

Page 7
Fig 3. It would be very useful to have the temperature profiles in this figure. This should be included as it is basic to non-neutral flow. (Suggest use I rather than TI; I is commonly used in meteorology.) It would also be helpful to include the cross-flow as an angle.

Page 8
L17 does this comment not apply to CBL as well as SBL and NBL?
L20 'of an upstream observer looking downstream.' is helpful to be quite clear.

Page 9
Fig 5. Presumably, the differences between a) and c) not being anti-symmetric is rotation in the wake. Which way is the turbine rotating, and therefore the wake in the opposite direction? Does this assist or oppose wind veer? I don't think there is mention of this.

Figs 5, 9 and 12. Say or show which way the rotor is rotating.

Fig 6. Why not show these as lines rather than points - perhaps using solid, dashed and broken lines?
L17. 'The resulting votices..' How does the vorticity get there, or is it an irrotational rotating motion?
L26 "The fitting method used.."
L32 ".. the extent.."

Page 11
L5 – Paragraph. Isn't it just that the turbulence intensity is larger in the CBL case? Are these large scale structures not seen in the NBL and SBL to any degree?

Page 12
L10 paragraph. This seems to overlook the much large v at low frequency, as shown in figure 4.

L25 '.. measurement device used.'

Page 16
Table 3. Parameters are not introduced, defined and discussed in the text.

Page 22
Fig 14. y/D and x/D, not as shown