The manuscript focuses on wind-farm-induced pressure fields, highlighting their important influence on flow through a wind farm. Historically, pressure has not been a significant consideration among modelers and analysts of wind farm flows, but this "friction-only" approach, as I believe the author put it in a previous paper, has fallen from favor over the last few years. The wind energy community is paying much more attention to inviscid influences now, and research that can provide more insight into these influences are very welcome. I believe that this paper falls into this category of research, but before publication I would recommend a number of changes. The following review starts with the **main comments**, listed roughly in order of priority, followed by a list of **minor comments**.

Main comments

1) Reliability and significance of the rigid lid results

The agreement between the GW and RL results is, in my view, poor. For example, internal wake recovery due to the favorable pressure gradient would be much different in the GW case than the RL case as illustrated in Figure 4 (the favorable gradient is much stronger in the RL case). The author acknowledges the differences between the GW and RL results on line 281: "The stability values need to be an order of magnitude larger before the rigid lid approximation becomes qualitatively accurate." Although it has its own simplifications, the GW model clearly offers a better representation of the interaction of a wind farm with the atmosphere than the RL model. Given this and the significant differences in the results, I am struggling to understand how I should glean credible insight into wind farm flows from the RL results. Yes, there are some qualitative similarities between the GW and RL results, perhaps most notably the favorable pressure gradient through the wind farm. However, I think even a very basic first-principles-based analysis would arrive at the conclusion that there must be a wind-farm-scale favorable pressure gradient through the wind farm.

As stated in the introduction, the paper aims to use the RL results to "clarify the cause, properties and impact of the pressure field." Could we not simply get this clarification from the GW model? Perhaps I missed something in the author's point about the causes of the pressure field as summarized in the section 6. When I first read the part about the pressure field responding to divergence in the turbine force field, I assumed it was in the context of the RL case only, after all equation 8, which is only valid for the RL case, is highlighted here. Is the author also making the point that the divergence of the force field influences the pressure field in the GW model? If so, it would be better to be more explicit about this point.

All that said, I did find the comparison between the RL and GW to be compelling. A few years ago, the industry started to use simple potential flow models, without consideration of stratification, to represent the impact of inviscid effects on wind farm flows. With the growing recognition that these models fall short and that stable stratification and gravity waves are important influences (due in no small part to the author's pioneering work in this area), many potential flow modelers are now trying to use a rigid lid to represent the impact of stratification on the wind farm. Your results suggest to me that a rigid lid does not offer a good approximation of the impact of stratification and gravity waves on wind farm flows and is therefore likely a significant source of error in models that use it instead of a more complete representation of the stably stratified atmosphere. If the author agrees with this view, *I feel it should be highlighted in the paper*. The matter has substantial practical implications for the industry, as potential flow codes, either without any modeling to represent

stable stratification or a rigid lid to represent its impact, are being used today to support the development of large wind farms, many of which are valued at well more than a billion dollars.

2) Wind-farm-induced pressure field without stratification

There are at least two parts of the manuscript that suggest that there would not be a wind-farm-induced pressure field without flow stratification. For example, the very first sentence of the abstract reads, "The disturbed atmospheric pressure near a wind farm arises from the turbine drag forces in combination with vertical confinement associated with atmospheric stability." Another example can be found in the lines 267-270, which can be (mis)read to mean that with no stratification there will be no pressure gradient forces. I think it is a fair assumption that the author is aware that there can be wind-farm-induced pressure disturbances without stratification. For example, line 33 of the manuscript ("the local non-hydrostatic pressure disturbances decays…") is consistent with this assumption.

The disturbed hydrostatic pressure field clearly has a significant impact on the wind farm flow. It clearly has a much larger impact on the flow farm upstream of the wind farm and the wind-farm-scale favorable pressure gradient through the wind farm as compared "local non-hydrostatic pressure disturbances". I'm just wondering if the highlighted sentences could be changed slightly to make them more accurate. I would be OK with just adding "primarily" in front of "arises" in the first sentence of the abstract (although local non-hydrostatic pressure disturbances, of course, have a big impact very close to the wind turbines). I don't have a specific edit for lines 267-270, but I believe they should be edited to avoid misunderstandings, as deceleration upstream of the wind farm would still happen without stratification or other confinement, just to a much smaller extent.

3) More description

In my opinion, readers would benefit from more detailed descriptions in the paper. At a number of points, I felt left to try to figure out the definition of a term or how an aspect of the model worked. Here are some examples:

- Please explicitly define DAR. I wasn't sure until I plugged in some numbers myself.
- The reader is also left to figure out the specific definition of F(x,y). It appears to be uniform in the wind farm area, pointing in the opposite direction of the flow, and zero outside. One can figure this out, but it would be better to be explicit here.
- What is "wrapping"?
- I think the reader would benefit from more description of the model. You reference Smith 2010 and 2022, and they are indeed very helpful when it comes to understanding the model. However, I think the reader would appreciate a more information about the model within the manuscript.

4) Utility of measuring pressure in the field

The last section recommends measuring pressure around a wind farm in part as a means of estimating the magnitude of the wind farm drag. This would, of course, be a very rough approximation. The turbine SCADA data in conjunction with the power and thrust coefficient curves for the model would provide a much more reliable estimate of the total wind farm drag than pressure measurements in combinations with equations 27 and 28.

Minor comments

Line 28: ‘so call “Blocking”’. “Blockage” is the more commonly used term in the wind energy community. It is also the term used in the paper. “so-called” should probably modify “blockage” rather than “so call”.

Line 80: “the pressure field increased from zero.” I think this phrasing can be improved upon. I’m pretty sure I understand what the author means when he writes that the “pressure field increased”, but maybe the “pressure disturbances increased” would be better.

Line 122: It may be worth pointing out that the right-most term in the equation is also zero.

Lines 172 and 176: The sentence starting “The Rayleigh force in this case is non-divergent…” on line 176 appears to repeat a point just stated on line 172 in the sentence starting “This independence of the pressure field…” Or perhaps I’ve missed a subtlety. If not, perhaps the second sentence should be deleted.

Line 294: There is a typo at the end of the line between “is” and “proportional”