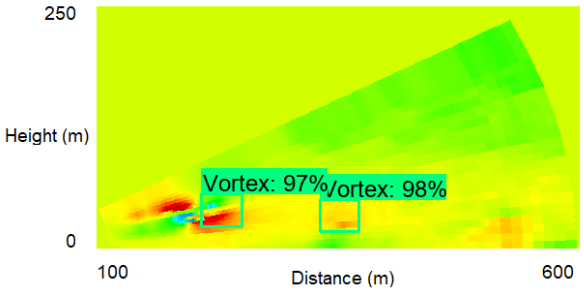

Figure 13. Two Vortices from Different Aircraft

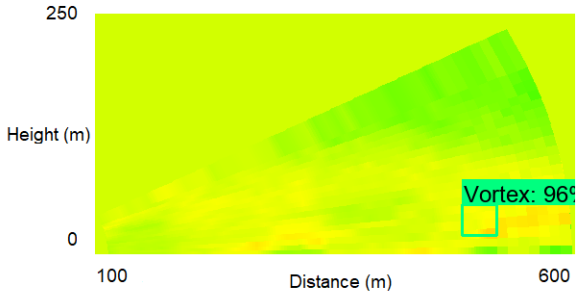

Figure 14. False Detection

VII. Anticipated Future Research

This study uses a straighforward approach to detect vortices based to translation of a scan to an image. There are several ways to develop this approach further:

- Real-time Capability Analysis: preliminary assessment shows that this approach can be used in real-time, since a single scan takes about 12 seconds, and subsequent processing time is neglible given proper hardware. However, realtime applications also raise non-technical (e.g. regulatory and quality assurance) issues that require futher research.
- More Wake Models: there are multiple emerging object detection models and neural network architectures. A study is required to assess whether these are more efficient to detect vortices.
- Polar Coordinates Detection: a LIDAR scan is naturally described in polar coordinates. However, a conventional CNN uses cartesian coordinates. There are models which address this. One can investigate whether these are applicable to vortex detection.
- Dynamic Approach: A vortex is a dynamic 4D object. In this study, we analyse a vortex section in isolation based on a single LIDAR scan. Considering several adjacent sections in a single model may enhance detection quality.

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