Vortices in the solar atmosphere present an ideal driving mechanism for Alfvén waves that can

efficiently carry energy in the upper layers of the chromosphere and corona. However, their theoretical interpretation, observational identification and classification is a challenging task. In this work we theoretically investigate the new type of large-scale vortex structures of dispersionless Alfvén waves. It is shown that Alfvén waves can propagate in the form of Alfvén vortices of finite characteristic radius. Also, we leverage a number of methods conventionally employed in turbulence to identify for the first time in the solar atmosphere vortices, in an automated fashion. We present an initial statistical analysis of the properties of the identified motions and relate this with theoretical results for such magnetic structures.