1162-65-188 **Kathryn P Drake**, **Edward J Fuselier** and **Grady B Wright***
(gradywright@boisestate.edu). *A meshfree partition of unity method for divergence-free/curl-free approximation.* Preliminary report.

Divergence-free/curl-free vector fields are pervasive in many areas of science and engineering, from fluid dynamics to electromagnetism. A common problem that arises in applications is that of reconstructing these vector fields based only on discrete samples. Additionally, it is often necessary that these reconstructions preserve the divergence-free or curl-free properties of the field to maintain certain physical constraints. Divergence-free/curl-free radial basis functions (RBFs) are a particularly good choice for this application as they are meshfree and the reconstructed fields analytically satisfy the divergence-free or curl-free property. A negative aspect of this approach is that the method is computationally expensive due to its global nature. In this talk, we discuss a new technique for bypassing this issue that combines divergence-free/curl-free RBFs in a partition of unity framework, where one solves local reconstruction problems and blends them together to a global reconstruction. A particular challenge with this approach that we explain how to overcome is maintaining the local divergence-free/curl-free properties in the global reconstruction. We present theoretical approximation results and demonstrate the effectiveness of the method on several problems. (Received August 31, 2020)