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Jeanne N. Clelland* (jeanne.clelland@colorado.edu) and **Taylor J. Klotz.** *Beltrami fields with nonconstant proportionality factor.* Preliminary report.

A *Beltrami field* on an open set $U \subset \mathbb{R}^3$ is a vector field \mathbf{u} on U satisfying the PDE system

$$\operatorname{curl} \mathbf{u} = f\mathbf{u}, \quad \operatorname{div} \mathbf{u} = 0$$

for some smooth function $f : U \rightarrow \mathbb{R}$, called the *proportionality factor*. When f is constant, \mathbf{u} is called a *strong Beltrami field*. Strong Beltrami fields are well-studied, but in this talk we consider the question: What nonconstant functions f can occur as the proportionality factor for a Beltrami field on an open subset $U \subset \mathbb{R}^3$? Enciso and Peralta-Salas showed that such functions are *rare*; in particular, they must lie in the kernel of a 6th-order, nonlinear partial differential operator.

By applying Cartan's method of moving frames and the theory of exterior differential systems, we can say more about the space of functions f that may occur as proportionality factors. We also consider the related question: For any such f , how large is the space of associated Beltrami fields? It turns out that the answer to this question depends crucially upon the geometry of the level surfaces of f . (Received September 17, 2019)