1123-35-141 **Jeanne Clelland*** (jeanne.clelland@colorado.edu), Dept. of Mathematics, 395 UCB, University of Colorado, Boulder, CO 80309-0395, and **Taylor Klotz** and **Stephen Preston**.

Beltrami fields with non-constant proportionality factor via moving frames. Preliminary report.

A Beltrami field on an open set in $\mathbb{R}^3$ is a vector field $\mathbf{u}$ satisfying the conditions

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

for some function f. When f is constant, local solutions depend on 2 arbitrary functions of 2 variables. For non-constant f, Encisco and Peralta-Salas have shown that solutions are rare; in fact, there are no solutions at all unless f satisfies an explicit differential equation.

In this work, we study Beltrami fields via a moving frames approach. For local solutions near any point where $\nabla f \neq 0$ we show that:

(1) If the level surfaces of f are open subsets of planes or spheres, there are no solutions unless the level sets of f are contained in parallel planes or concentric spheres, in which case solutions depend on 2 functions of 1 variable.

(2) Otherwise, there is at most a 3-dimensional space of solutions.

Unfortunately, the question of precisely which functions f admit solutions remains computationally intractable. A Cartan-Kähler argument suggests that such functions f should depend on 3 functions of 2 variables, so the question remains: which functions f admit solutions, and how many solutions does each such function admit? (Received August 23, 2016)