Meeting: 1001, Evanston, Illinois, SS 7A, Special Session on Geometric Partial Differential Equations

1001-76-120 **William P. Ziemer*** (ziemer@indiana.edu), Mathematics Dept, Indiana Univesity, Bloomington, IN 47495. *The normal trace of vector fields with weak divergences.* Preliminary report.

We will discuss some current work and some recent progress that have been made in an area that was initiated by Gui-Qiang Chen, namely, the normal behavior of vector fields $F \in L^p(R^n; R^n)$, $1 \le p \le \infty$, whose divergences are Radon measures. A result that is critical to our investigations is the following

Theorem (Fuglede) Suppose $F \in L^p(R^n; R^n)$, $1 \le p \le \infty$, is a vector field with $divF = f$, where $f \in L^1$. Then there exists a function $g : R^n \to R$ with $g \in L^p$ such that

$$\int_E divF = \int_E f = \int_{\partial^* E} F(y) \cdot \nu(y)\, dH^{n-1}(y)$$

for all sets of finite perimeter E except possibly those for which

$$\int_{\partial^* E} g\, dH^{n-1} = \infty.$$

This was recently used to establish the following:

Theorem With F as above and with $divF = \mu$, where μ is a signed measure, let E be an open set with Lipschitz boundary. Then, M. Torres recently proved that there exists a measure σ on ∂E such that

$$\mu(E) := \int_E divF = \int_{\partial E} \sigma.$$

If $p = \infty$, the result remains true for sets E with finite perimeter. We will discuss the possibility of this result remaining true for $1 \le p \le \infty$. (Received August 18, 2004)