1109-05-86 **Jian Cheng*** (`jiancheng@math.wvu.edu`). *Vector Flows and Integer Flows.*

A vector S^d-flow is a flow whose flow values are vectors in S^d, where S^d is the set of all unit vectors in $\mathbb{R}^{d+1}$. DeVos and Thomassen proved that a graph has a vector S^1-flow if it has a nowhere-zero integer 3-flow. Thomassen pointed out that a graph admitting a vector S^1-flow may not necessarily admit a nowhere-zero integer 3-flow and presented a family of examples showing that the converse is not true.

The rank of a vector S^1-flow (D, f) is defined as the rank of linear space generated by all balanced vectors $\epsilon(v) = (\epsilon_1(v), \epsilon_2(v), \ldots, \epsilon_b(v))$ for all $v \in V(G)$, where $\epsilon_i(v)$ is the difference between the number of outcoming edges with flow value α_i from v and the number of ingoing edges with the same flow value to v. We prove that G admits a nowhere-zero integer 3-flow if G admits a vector S^1-flow with rank at most two. This result is sharp since there are examples that admit vector S^1-flows with rank at least 3, but no nowhere-zero integer 3-flows. This is joint work with R. Luo, Y. Wang and C.-Q. Zhang from West Virginia University. (Received January 24, 2015)