1120-05-314 **Heather C Smith*** (heather.smith@math.gatech.edu), **László Székely** (szekely@math.sc.edu), **Hua Wang** (hwang@georgiasouthern.edu) and **Shuai Yuan** (syuan@math.sc.edu). *Extremal properties of vertex attributes in trees.*

For tree T and vertex v, define the eccentricity $ecc(v) := \max_{u \in V(T)} d(u,v)$, the distance $d(v) := \sum_{u \in V(T)} d(u,v)$ and the number of subtrees $F(v)$ containing vertex v. Each defines a "middle" of the tree consisting of the vertices with the maximum (or minimum) value.

First, we explore the interactions of $ecc(v)$ and the total eccentricity $Ecc(T) := \sum_{v \in V(T)} ecc(v)$ by examining extremal values and structures for the ratios $\frac{ecc(v)}{ecc(u)}$ and $\frac{Ecc(T)}{ecc(v)}$, the behavior of which is more delicate that of the numerator or the denominator alone. Analogous studies have been done for distance [Barefoot, Entringer, Székely, Discrete Appl. Math. **80** (1997), 37-56] and number of subtrees [Székely, Wang, Electron. J. Combin. **20** (2013) 1-20]. We also compare the three different middles, determining how far apart they can appear in a single tree and characterizing many of the extremal structures. (Received February 23, 2016)