William Graham and Wenjing Li* (wli@simpsonu.edu). The Bruhat order, the lookup conjecture and spiral Schubert Varieties of type $\tilde{A}_2$.

Although the Bruhat order on a Weyl group is closely related to the singularities of the Schubert varieties for the corresponding Kac-Moody group, it can be difficult to use this information to prove general theorems. This paper uses the action of the affine Weyl group of type $\tilde{A}_2$ on a Euclidean space $V \cong \mathbb{R}^2$ to study the Bruhat order on $W$. We believe that these methods can be used to study the Bruhat order on arbitrary affine Weyl groups. Our motivation for this study was to extend the lookup conjecture (which is a conjectural simplification of the Carrell-Peterson criterion for rational smoothness) to type $\tilde{A}_2$. Computational evidence suggests that the only Schubert varieties in type $\tilde{A}_2$ where the “nontrivial” case of the lookup conjecture occurs are the spiral Schubert varieties, and as a step towards the lookup conjecture, we prove it for a spiral Schubert variety $X(w)$ of type $\tilde{A}_2$. The proof uses descriptions we obtain of the elements $x \leq w$ and of the rationally smooth locus of $X(w)$ in terms of the $W$-action on $V$. (Received September 23, 2015)