Global phase portraits of quadratic systems with a semi--elemental triple node

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Planar quadratic differential systems occur in many areas of applied mathematics. Although more than one thousand papers have been written on these systems, a complete understanding of this family is still missing. Classical problems, and in particular, Hilbert's 16th problem, are still open for this family. In this talk we shall discuss how to make a global study of the family $QT\overline{N}$ of all real quadratic polynomial differential systems which have a semi--elemental triple node (triple node with exactly one zero eigenvalue). This family modulo the action of the affine group and time homotheties is three--dimensional and we give its bifurcation diagram with respect to a normal form, in the three--dimensional real space of the parameters of this form. This bifurcation diagram yields 28 phase portraits for systems in $QT\overline{N}$ counting phase portraits with and without limit cycles. Algebraic invariants are used to construct the bifurcation set. The phase portraits are represented on the Poincaré disk. The bifurcation set is not only algebraic due to the presence of a surface found numerically.

This is a joint work with Alex C. Rezende (ICMC-USP) and Joan C. Artes (UAB-Barcelona).