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Fabric attractors in non steady flows and their application to shear zones

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Deformation is generally treated as homogeneous and steady state (in the sense that the kinematics of the flow at a given material particle is not varying with time) because the mathematical description become too complex otherwise. However several fields, experiment and theoretical works showed that imposed boundary condition as well as rheological properties of rocks generally change during the course of deformation. This implies that the deformation could vary with time. Moreover it is mathematically demonstrated that heterogeneous deformation is generally non steady (Jiang &Williams, 1999). Non steady state flow imply that the principal stable directions of flow expected to control the final orientations of the principal strain axes as well as the final fabric distribution varies in time and in space. This property strongly limits any attempt to reconstruct flow history in a unique way as different kinematics histories could produce the same end results. It follows then that structures cannot be generally interpreted in term of unique flow pattern.The aim of this abstract is to give a contribution to the knowledge of the possible flow pattern and related structures produced in some specific non - steady flow. With this purpose we introduce the concept of stability analysis (using Lyapunov method) as a criterion to describe the flow pattern. The theory is briefly explained and it is shown the potentiality of such method on unravelling the geometrical relationship between eigen-directions in some simple non steady flows. The concept of fabric attractor is then revisited and a kinematic classification of non steady flow systems is proposed. Finally we shows that within specific non steady shear zones a stable fabric weakly deviating from the correspondent steady flow system could be expected and the lacking of field data describing strange and/or chaotic fabric attractor within non steady shear zones is also discussed.

Jiang. D. & Williams, P.F. (1999). *Journal of Structural Geology*. 21, 933-937.