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Semiflows which preserve invariance of cones of high ranks

We consider semiflows in general Banach spaces motivated by monotone cyclic feedback systems or differential equations with integer-valued Lyapunov functionals. These semiflows preserve the invariance of cones of high ranks, implying order-related structures on the limit sets of precompact semi-orbits. We show that for a pseudo-ordered precompact semi-orbit the limit set is either ordered, or is contained in the set of equilibria, or possesses a certain ordered homoclinic property. We show that if the omega set contains no equilibrium, then this set is ordered and hence the dynamics of the restricted semiflow is topologically conjugate to a compact flow on a finite dimensional space. Applications to Poincare-Bendixson theorem in infinite dimensional spaces is obtained. This is based on joint work with L. Feng and Y. Wang.