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Convex co-compact subgroups of the mapping class group

It is a well known question whether there are hyperbolic 4-manifolds that fiber over a surface. For any 4-manifold that fibers over a surface the fibers will also be a surface (usually of different topological type) and the monodromy defines a homomorphism from the fundamental group of the base surface into the mapping class group of the fiber. Farb and Mosher defined a notion of convex co-compactness for subgroups of the mapping class group and showed that the monodromy map is an injection to a convex co-compact subgroup if the manifold is hyperbolic. It is therefore of great interest to understand convex co-compact subgroups of the mapping class group. Farb and Mosher also showed that any such subgroup is both purely pseudo-Anosov (every non-trivial element is pseudo-Anosov) and undistorted. We will show that these necessary conditions are also sufficient. This is joint work with M. Bestvina, A. Kent and C. Leininger.