Positivity of the Chow-Mumford line bundle for families of K-stable klt Fano varieties

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The Chow-Mumford (CM) line bundle is a functorial line bundle defined on the base of any family of polarized varieties, in particular on the base of families of klt Fano varieties. It is conjectured that it yields a polarization on the conjectured moduli space of K-semi-stable klt Fano varieties. This boils down to showing semi-positivity/positivity statements about the CM-line bundle for families with K-semi-stable/K-polystable fibers.

In this talk, I will present a proof of the necessary semi-positivity statements in the K-semi-stable situation, and the necessary positivity statements in the uniform K-stable situation, including in both cases variants assuming stability only for very general fibers. These results work in the most general singular situation (klt singularities), and the proofs are algebraic, except the computation of the limit of a sequence of real numbers via the central limit theorem of probability theory. I will also present an application to the classification of Fano varieties. This is a joint work with Zs. Patakfalvi.