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Volume forms

Let $\mathcal{L}$ and $\mathcal{F}$ be a rank 1 and respectively a rank n locally free sheaf over an m-dimensional smooth algebraic variety X. Consider an exact sequence $0 \to \mathcal{L} \to \mathcal{E} \to \mathcal{F} \to 0$ associated to an element $\xi \in \mathrm{Ext}^1(\mathcal{F}, \mathcal{L})$ and the induced exact sequence:

$$0 \to \bigwedge^{n-1} \mathcal{F} \otimes \mathcal{L} \to \bigwedge^{n} \mathcal{E} \to \det \mathcal{F} \to 0.$$

If W is an $n+1$ dimensional subspace of $\mathrm{Ker}(\partial_\xi \colon \mathrm{H}^0(\mathrm{X}, \mathcal{F}) \to \mathrm{H}^1(\mathrm{X}, \mathcal{L}))$ then we can associate to W and ξ a top form $\Omega \in H^0(X, \det \mathcal{E})$ up to liftings of W to $H^0(X, \mathcal{E})$. We study the geometry of these top forms. This theory is a strong generalisation of the analogue one shown in the paper *Variations of the Albanese morphisms*, J. A. G. 12 (2003), no. 3, 535–572 written with G. P. Pirola. In particular we prove a version of the *Adjoint theorem* which is valid in any dimension m and for any rank n l.f. sheaf $\mathcal{F}$; its original version in the case $m = n = 1$ is in *The Griffiths infinitesimal invariant for a curve in its Jacobian* Duke Math. J. 78 (1995), no. 1, 59–88 written by A. Collino and G.P. Pirola.

As a byproduct, we recover the Griffith's infinitesimal Torelli theorem for projective hypersurfaces; that is: Theorem 9.8 (b) of *On the Periods of Certain Rational Integrals: I,* Ann. of Math. (2) 90 (1969), 460–495, and the Green's infinitesimal Torelli theorem for a generic hypersurface X of a sufficiently ample linear system on a smooth variety Y; see: *The period map for hypersurface sections of high degree of an arbitrary variety*, Compositio Math. 55 (1985), 135–156.