Title: Incidence equivalence versus Abel-Jacobi equivalence for $(n-1)$-cycles on a complex projective $(2n-1)$-manifold

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Abstract: Given an $(n-1)$-cycle Z which is homologically equivalent to zero on a complex projective $(2n-1)$-manifold X, one can associate two types of invariants.The first is the Abel-Jacobi image of Z, namely

$$\{Z\} \mapsto \int_{\Gamma} \in J(X) := \frac{F^n H^{2n-1}(X;\mathbb{C})^{\vee}}{H_{2n-1}(X;\mathbb{Z})},\ \partial\Gamma = Z.$$

The second asigns to every flat family I/T of $(n-1)$-cycles on X, the incidence divisor class $\{p_*(q^*(Z))\} \in Pic^0(T)$ associated to

$$\begin{array}{ccc} I & \stackrel{q}{\longrightarrow} & X \\ \downarrow^{p} & & \\ T & & \end{array}.$$

Notice that, if Z is rationally equivalent to zero, then $p_*(q^*(Z))$ is principal and the Abel-Jacobi image of Z is zero. About 40 year ago Griffiths made the following conjecture: Given an $(n-1)$-cycle Z which is algebraically equivalent to zero on a complex projective $(2n-1)$-manifold X, then the image of the Abel-Jacobi mapping is torsion if and only if, for every flat family I/T of $(n-1)$-cycles on X, the incidence divisor $p_*(q^*(Z))$ associated to

$$\begin{array}{ccc} I & \stackrel{q}{\longrightarrow} & X \\ \downarrow^{p} & & \\ T & & \end{array}$$

is torsion in $Pic^0(T)$. Using our recent extension of the classical notion of height pairing on algebraic $(n-1)$-cycles, we prove a precise form of Griffiths' conjecture.