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Greg Friedman (g.friedman@tcu.edu), **Anibal Medina** (anibal.m3@gmail.com) and **Dev Sinha*** (dps@uoregon.edu). *Flowing from intersection product to cup product.*

We use a vector field flow defined through a cubulation of a manifold to relate the manifold cochains of a closed manifold, which have a partially defined commutative product, to the cubical cochains, which have a fully defined E_∞ -product.

In addition to having applications in algebraic and geometric topology, the question of relating vector field flows to finer cochain structures has recently arisen in mathematical physics, but the vector fields constructed have been non-continuous – defined on simplices but needing a branching structure to reconcile differences on faces. Our flow is globally smooth and thus should serve as a strong bridge between physical models, geometry and topology. Manifold cochains have primarily been developed as a parallel to or for application in Floer theory and other types of moduli questions. Our work invites the possibility of Steenrod operations or more eventually E_∞ -structures being developed in such settings. (Received January 26, 2021)