1086-65-1842 **Douglas N. Arnold** and **Daniele Boffi*** (daniele.boffi@unipv.it), Dipartimento di Matematica "F. Casorati", Via Ferrata 1, 27100 Pavia, PV, Italy, and **Francesca Bonizzoni**.

Approximation properties of tensor product finite element differential forms. Preliminary report.

It is well known that standard quadrilateral (resp. hexahedral) finite elements are constructed starting with a given finite dimensional space on a square (resp. cubic) reference element and then transformed to the actual element via a bilinear (resp. trilinear) isomorphism of the square (resp. cube) onto the element. The approximation properties of the above spaces depend on the reference space and on the considered transformation.

We discuss the abstract construction of tensor product of complexes of differential forms. This allows in a natural way the definition of shape functions and degrees of freedom for finite element differential forms of order k on cubes in n dimensions. This construction can be extended via the pullback transformation to curvilinear cubic elements, obtained as images of a reference cube. In this context we study the approximation properties of the resulting finite element spaces. When the maps from the reference cube are affine, the approximation rate depends only on the degree of polynomials contained in the reference space; in the more general case, when the maps are multilinear, a degradation in the approximation rate is observed, the loss being more severe for higher degree differential forms. (Received September 24, 2012)