World Academy of Science, Engineering and Technology
International Journal of Mathematical and Computational Sciences
Vol:12, No:06, 2018

An Equivalence between a Harmonic Form and a Closed Co-Closed Differential Form in L^Q and Non-L^Q Spaces

Authors : Lina Wu, Ye Li

Abstract : An equivalent relation between a harmonic form and a closed co-closed form is established on a complete non-compact manifold. This equivalence has been generalized for a differential k-form ω from Lq spaces to non-Lq spaces when q=2 in the context of p-balanced growth where p=2. Especially for a simple differential k-form on a complete non-compact manifold, the equivalent relation has been verified with the extended scope of q for from finite q-energy in Lq spaces to infinite q-energy in non-Lq spaces when with 2-balanced growth. Generalized Hadamard Theorem, Cauchy-Schwarz Inequality, and Calculus skills including Integration by Parts as well as Convergent Series have been applied as estimation techniques to evaluate growth rates for a differential form. In particular, energy growth rates as indicated by an appropriate power range in a selected test function lead to a balance between a harmonic differential form and a closed co-closed differential form. Research ideas and computational methods in this paper could provide an innovative way in the study of broadening Lq spaces to non-Lq spaces with a wide variety of infinite energy growth for a differential form.

Keywords : closed forms, co-closed forms, harmonic forms, L^q spaces, p-balanced growth, simple differential k-forms
Conference Title : ICDGA 2018 : International Conference on Differential Geometry and Applications
Conference Location : New York, United States
Conference Dates : June 03-04, 2018