Geophysical Research Abstracts
Vol. 15, EGU2013-7249, 2013
EGU General Assembly 2013

General expressions of seismic solitary wave by differential geometry of higher-order spaces

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A relationship between solitary wave in seismology and a geometric Lagrangian is discussed in the non-Euclidean space called the Kawaguchi space. Based on a function in the Kawaguchi space and a parameter invariant condition, Zermelo condition, general expressions of non-linear solitary wave equations are derived geometrically. Especially, the geometric description of seismic solitary waves is considered. Then, it is shown that the equations of motion of seismic solitary wave can be obtained from a geometric Lagrangian with higher-order terms. In this case, the order of partial derivative in evolution equation corresponds to the order of Kawaguchi space. Thus, this geometric approach of Kawaguchi space or higher-order space shows unified expressions of many geophysical soliton systems found in seismic waves.