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GR focus review

Origin and significance of olistostromes in the evolution of orogenic belts: A global synthesis

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ABSTRACT

Olistostromes (sedimentary mélanges) represent the products of ancient submarine mass transport processes. We present a comparative analysis of the occurrences and internal structures of these sedimentary mélanges at a global scale with a focus on the Circum-Mediterranean, Appalachian and Circum-Pacific regions, and discuss their formation and time-progressive evolution in different tectonic settings. Lithological compositions, stratigraphy, and structural features of olistostromes reflect the operation of an entire spectrum of mass transport processes during their development through multi-stage deformation phases. The general physiography and tectonic setting of their depocenters, the nature, scale and rate of downslope transformation mechanisms, and global climatic events are the main factors controlling the internal structure and stratigraphy of olistostromes. Based on the tectonic settings of their formation olistostromes are classified as: (i) passive margin, (ii) convergent margin and subduction–accretion, and (iii) collisional and intra-collisional types. Systematic repetitions of these different olistostrome types in different orogenic belts provide excellent markers for the timing of various tectonic events during the Wilson cycle evolution of ocean basins. Olistostromes are best preserved in paleo active margins, covering vast areas of thousands of km^2, where they underwent significant downslope translation, up to hundreds of kilometers. Incorporation of olistostromes into subduction–accretion complexes and orogenic belts takes place during discrete episodes of tectonic events, and their primary (sedimentary) fabric may be commonly reworked and overprinted by subsequent phases of tectonic and metamorphic events. We apply the basic nomenclature of structural geology, sedimentology and basin analysis in studying the internal structure, lithological makeup, and mechanisms of formation and extraordinary downslope mobility of olistostromes.

Contents

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