University of Victoria | Graduate Studies

Notice of the Final Oral Examination
for the Degree of Doctor of Philosophy

of

JESSICA SHAW

BSc (Humboldt State University, 2008)

"Oroclines of the Iberian Variscan Belt: Tectonic and Paleogeographic Implications"

School of Earth and Ocean Sciences

Thursday, August 13, 2015
1:30 P.M.
Bob Wright Centre
Room A319

Supervisory Committee:
Dr. Stephen Johnston, School of Earth and Ocean Sciences, University of Victoria (Supervisor)
Dr. Dante Canil, School of Earth and Ocean Sciences, UVic (Member)
Dr. Eileen Van der Filer-Keller, School of Earth and Ocean Sciences, UVic (Member)
Dr. Terri Lacourse, Department of Biology, UVic (Outside Member)

External Examiner:
Dr. Ben van der Pluijm, Department of Earth and Environmental Sciences, University of Michigan

Chair of Oral Examination:
Dr. Julian Lum, Department of Biochemisty, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

The Western European Variscan orogenic belt is thought represent the final in a series of Paleozoic continental collisions that culminated with the amalgamation of the supercontinent Pangea. The Iberian segment of the Variscan belt is characterized by the 180-degree convex toward the west Cantabrian orocline. Several lines of evidence are at odds with classical interpretation of the Cantabrian orocline as the core of the much larger 'Ibero-Armorican' arc, suggesting instead that it is structurally continuous with a second more southerly and complimentary orocline. Paleocurent data collected from the Lower Ordovician Armorican Quartzite of the deformed Iberian Paleozoic passive margin sequence confirm the existence of the so-called Central Iberian orocline. Structural continuity between the Cantabrian and Central Iberian oroclines suggests that they formed contemporaneously and in the same fashion. Mesoscale vertical-axis folds deforming slaty cleavage and shear fabric within the Ediacaran Narcea Slates have a dominant vergence toward the hinge of the Cantabrian orocline, suggesting that its formation was in part accommodated by a mechanism of flexural shear during buckling of a linear belt in response to an orogen parallel principle compressive stress. The Cantabrian-Central Iberian coupled oroclines therefore palinspastically restore to an originally linear belt 2300 km in length. Provenance analysis of detrital zircons sampled from the Armorican Quartzite along a 1500 km long segment of the palinplastically restored Iberian passive margin indicate that it originated in a paleogeographic position stretching east-west along the northern limits of north African Gondwana, from the Arabian-Nubian Shield to the Sahara Metacraton. Paleomagnetic data and the distribution of Variscan ophiolites support a model of mid-Paleozoic separation of the Variscan autochthon (Armorican continental ribbon) from north Gondwana preceding or in conjunction with a ninety-degree rotation required to reorient the ribbon to a Late Carboniferous north-south trend. Formation of the Iberian coupled oroclines accommodated 1100 km of orogen parallel shortening. The Western European Variscan belt, North American Cordillera, and Eastern European Alpine system are orogens similarly characterized by both coupled oroclines and paleomagnetic inclinations that are significantly shallower than cratonic reference values. Palinspastic restoration of the Alaskan and Carpathian–Balkan coupled oroclines fully resolves inclination anomalies within the Cordillera and Eastern Alpine system, respectively. Inclination anomalies within the Iberian Variscan belt are only partially resolved through palinspastic restoration of the Iberian coupled oroclines, but the sinuous geometry of the belt is not yet fully deciphered. Oroclines within the Western European Variscan belt, not the orogen itself, provide the true record of Pangean amalgamation.