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The major Adassil-Medinet fault; a complex evolution of high angle transpressive Variscan shear zones (Western High Atlas, Morocco)

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ABSTRACT

The Western High Atlas is one of the most important sectors of the Variscan foldbelt in Morocco and also of its Alpine intracontinental orogen. Its tectonic evolution is thus essential for the understanding, not only of the Moroccan geology, but also of the interaction between successive orogenic cycles which is one of the focus of this article. Furthermore, as the Moroccan Variscides must be seen in the context of the complex dextral collision between Laurasia and Gondwana, this is also a contribution to the comprehension of the complexity of transpressive regimes and strain partitioning processes.

New data show that WNW-ESE sinistral Variscan shear zones (mainly the Addouz-Adassil-Anamrou one - AAAsz), although secondary to the main orogenic scale ENE-WSW dextral shear zones, must be considered in order to understand the Late Paleozoic deformation and its Alpine reactivation. In fact, the concentration of the last stages of the Variscan ductile deformation in the steep and irregular AAAsz played an important role in the initiation and localisation of the minor magmatic events and influenced the geometry and kinematics of the Late Variscan WNW-ESE sinistral shear zones. Furthermore, during the Alpine inversion, the orientation of the AAAsz and related major anisotropies tend to be reactivated, with a major reverse component, giving rise to the irregular Adassil-Medinet fault zone, one of the most important structures of the Western High Atlas.

1. Introduction

Due to the complex geodynamic evolution of this region the Moroccan Variscides is a highly debatable subject (*e.g.* Piqué et al., 1990; Hoepffner et al., 2005, 2006a, 2006b; Roddaz et al., 2006; Piqué et al., 2007; Simancas et al., 2005, 2009, 2010; Michard et al., 2010a, 2010b; Chopin et al., 2014; Wernert et al., 2016; Martínez Catalán et al., 2021; Chopin et al., 2023). In fact, its very particular position has led to interference between different tectonic cycles, either related to the Pangea assemblage (Fig. 1A), the Tethys and Atlantic rifting or the Alpine shortening. Therefore, it is sometimes debatable, not only to interpret the observed structures, but also to integrate them into a coherent geodynamic model (*e.g.* Michard et al., 2008, 2010a; Dias et al., 2011; Domènech et al., 2016; Fekkak et al., 2018a; Leprêtre et al., 2018a; Ellero et al., 2020; Skikra et al., 2021). The observed three main tectonic domains in the Morocco Variscan belt (Fig. 1B) is the result of such a complex geodynamic evolution: the Anti-Atlas to the South, the Meseta (divided into Western and Eastern Meseta, now separated by the Middle Atlas) and the northern Sehoul domains (*e.g.* Michard et al., 2010a; Chopin et al., 2023). In order to understand the geometry and kinematics of these domains, such a long lasting geological evolution must be taken into account. Either the boundaries between these three major domains or their internal minor blocks, have been reworked and deformed during the Mesozoic rifting and the Cenozoic compressive events (Domènech et al., 2016; Leprêtre et al., 2018), due to the interaction between Eurasia and Africa plates (El Harfi et al., 2006; Ribeiro et al., 2007; Simancas et al., 2009; Michard et al., 2010a; Ellero et al., 2020; Skikra et al., 2021). This gives rise to the juxtaposition of wide sectors with predominance of weakly deformed Cenozoic sedimentary sequences (*e.g.* Haouz and Sousse plains), separated by elevated blocks with a more complex structure (Schaer, 1967; Mattauer et al., 1977; Proust et al., 1977; Jenny, 1983; Piqué et al., 2002; Fekkak et al., 2018a;

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