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Cenozoic geology of the Yolomécatl-Tlaxiaco area, Northwestern Oaxaca, Southeastern Mexico: Stratigraphy, structure and regional significance

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ABSTRACT

The Yolomécatl-Tlaxiaco Area, lies in the rugged Sierra Madre del Sur (SMS) of northwestern Oaxaca (YOTLA), southeastern Mexico. Within the area Cenozoic units unconformably overlie metamorphic, clastic and carbonate rock units of Late Paleozoic to Cretaceous ages as well as the Mixteco/Oaxaca Terrane boundary.

The Cenozoic sequence, emphasized herein, includes from botton to top: (1) basal, calcilithitic Early Tertiary Tamazulapam Conglomerate, (2) andesitic lava flows of Nduayaco "Group," (3–4) Epiclastic/pyroclastic strata composing Yolomécatl Formation (~40.3 ± 1.0 Ma), and Tayata Pyroepiclastics (5) Early Oligocene (~32.9 Ma), felsic, pyroclastic Nundichi "Group," (6) Late Oligocene (~27.7 ± 0.7 Ma) andesitic lava flows of Nicananduta "Group" containing intercalations of unit (7) ?Chilapa Formation (largely lacustrine). Quaternary deposits unconformably overlie the sequence. The structural record includes NNW-SSE folds in the Mesozoic units, and one in Tayata Pyroepiclastics, as well as numerous fractures/faults of diverse types, whose pattern seems to roughly define four geographic/structural domains, NW, SW, S, and E.

The Tertiary sequence records four magmatic and six deformational events: Pre-Late Eocene Extension accommodated by the Tamazulapam fault, along which magma of the Nduayaco "Group" moved upward. The next episode is the earliest Late Eocene extension recorded by the Yucuxaco-Santa Cruz Tayata fault was followed by accumulation of Yolomécatl Formation, Tayata Pyroepiclastics, and synsedimentary emplacement of tuff sheets at ~40.3 ± 1.0 Ma. After this date, left lateral transpression emplaced a Teposcolula Limestone block over Nduayaco "Group" and ?Yolomécatl Formation, whereas the Tayata Pyroepiclastics was folded into an open anticline. Movement along the Yucuxaco-Santa Cruz Tayayata fault suite influenced accumulation of the Nundichi "Group" strata ca. ~32.9 Ma. Subsequent ENE-WSW extension affected the Nundichi "Group," partly placing it in contact with Jurassic limestone blocks. Finally, ca. 27.7 Ma, the Nicananduta "Group" was emplaced.

The discrimination of YOTLA's Cenozoic magmatic/deformational events correlates well with that of events previously recognized in the SMS, and to the north along the southwestern margin of North America. However, significant differences persist in terms of number, characterization, age and duration of events that cannot be resolved at present. Anyway, differences are expected due to the inherent diachronic nature of magmatism and deformation across SMS, and the fact that the events reported here

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took place inland, not around the Mixteco/Oaxaca Terranes block, where most events of these kinds occurred.

1. Introduction

The Yoloméctal-Tlaxiaco area (YOTLA herein) northwestern Oaxaca State (Fig. 1) lies in Southeastern Mexico, a region in which rugged relief and complex geologic makeup, render the unraveling of geologic evolution difficult (see Böhnel, 1999; Morán-Zenteno et al., 1999; Elías-Herrera et al., 2005; Cerca et al., 2007; Santamaría-Díaz et al., 2008; Ratschbacher et al., 2009; Campos-Enríquez et al., 2010). This is shown in the widely different interpretations on this region's geology expressed in the corresponding regional maps.

For instance, the stratigraphy of Tertiary units is controversial, as shown among others, by these geologic maps of YOTLA: The INEGI map (1994; Figure A1, see Appendix A. Appendix Figures are referred to as Figure A1 and consecutive numbers hereafter) includes eight units, five for the Early Tertiary, two in the Middle Tertiary, and one in the Late Tertiary. However, in SGM (2000a; Figure A2) only two units are differentiated, one sedimentary and one volcanic. On the other hand, Santamaría-Díaz et al. (2008, Figure A3), discriminate four units, three sedimentary and one volcanic. If the comparison is extended to other regional works, e.g. López-Ticha (1985), Meneses-Rocha et al. (1994), the result would be the same.

There are also differences about the Tamazulapam fault, a Southeastern Mexico's major structure that lies in YOTLA: (a) López-Ticha (1985) and Meneses-Rocha et al. (1994), infer that it is the boundary of the Mixtecan and Oaxacan terranes. (b) Elías-Herrera and Ortega-Gutiérrez (2002) regarded the Caltepec, not the Tamazulapam fault as the boundary. (c) Elías-Herrera et al. (2005) think that the Caltepec fault extends southward to the

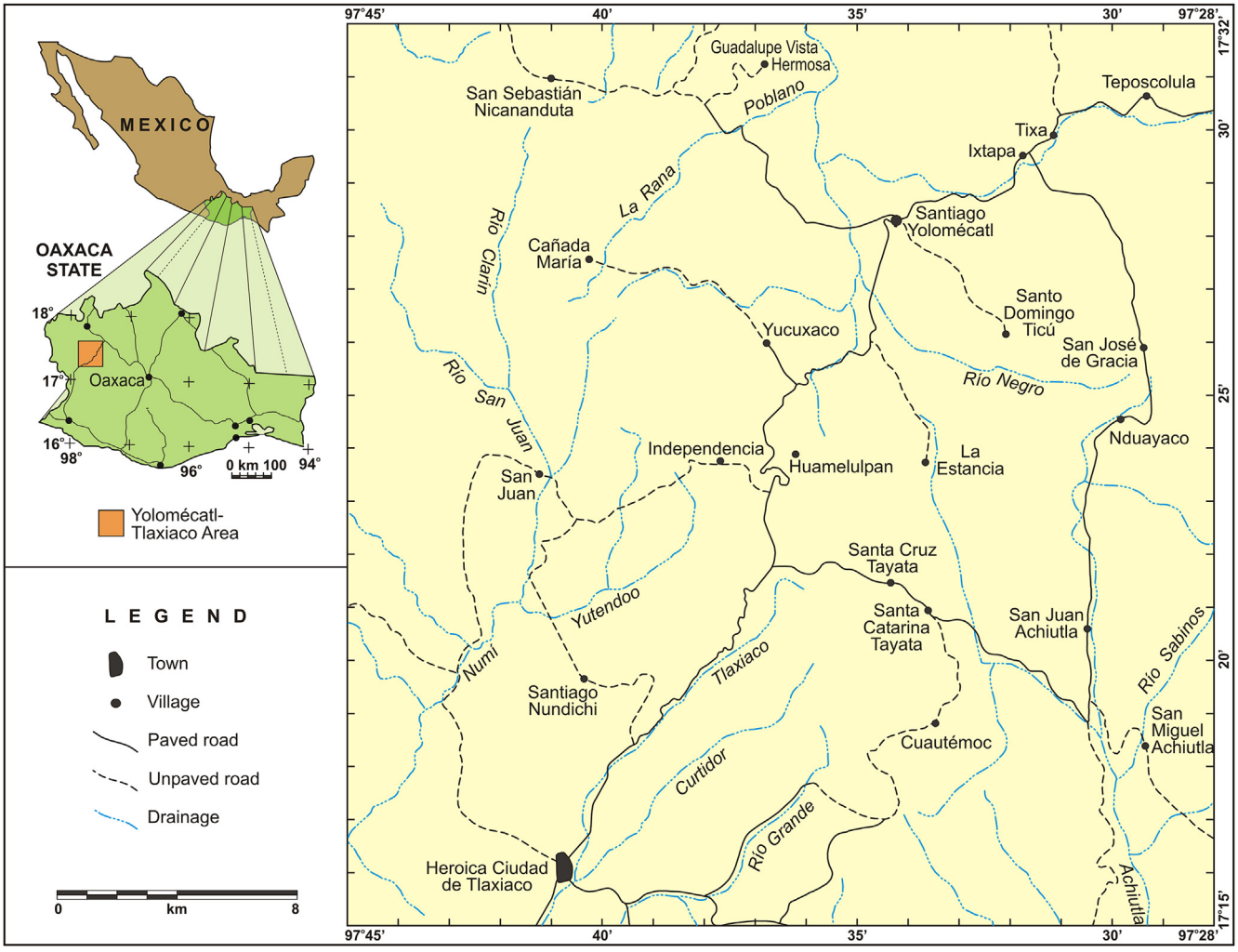

Fig. 1. Location of the Yolomécatl-Tlaxiaco Area, northwestern Oaxaca State, Southeastern México. The area's topographic map shows the position and names of features mentioned in the text.