Western central Andean neotectonics: What we know and where we go from here

J. Bruce H. Shyu, Mark Simons, and Jean-Philippe Avouac, Tectonics Observatory, California Institute of Technology

Several N-S trending topographic units. From west to east, these units are the Coastal Cordillera (CC), the Central Depression (CD), the Precordillera (PC), and the Western Cordillera. From west to east, these units are the Coastal Cordillera (CC), the Central Depression (CD), the Precordillera (PC), and the Western Cordillera.

Figure 2. Selected previous mapping of possible active structures in Coastal Cordillera. (a) Stacked relief map of Coastal Cordillera. (b) Between 19 Myr and 21 Myr, Allmendinger et al. (1995) identified a series of dextral strike-slip systems. We suggest that they are right-lateral faults with possible dextral component. (c) Bosnia relief map of the Atacama Basin, isochronous layers, and a series of reverse faults. These faults are dextral strike-slip faults with possible dextral component. The youngest system is a 250 Myr dextral system, which is the most likely to be active. (d) Cowen et al. (2009) showed that the dextral system is a 250 Myr dextral system.

This experience led us to realize that, for Coastal Cordillera, due to the lack of active drainages to serve as offset markers and the fact that offset surface deposits, since the youngest sediments are mostly non-marine and contain minerals not hard to fold. Therefore, we are unsure if these faults are active or not. For the same reason, no photos is shown as a red arrow in (a).

Figure 3. (a) Several normal faults have produced the approximately N-S trending ridge west of the Salar de Atacama in the Atacama Basin. (b) A red arrow in (a).

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Figure 4. Although many of the previously mapped active structures were identified, they have formed basins at the surface in the Coastal Cordillera map in fact very old. For example, in recent exposure areas, we have found some of the oldest active structures to the surface in older structures, as mapped by Allmendinger et al. (1995), here, may have been active for tens of millions of years.

Figure 5. Occasionally, cross-cutting relationships between structures can help to elucidate the presence of different ages. In this preliminary map, which was derived from a map of the Atacama Basin in 1995, we have identified several active systems. One is a 350 Myr active system and the other is a 250 Myr dextral system, which is the most likely to be active. (c) Cowen et al. (2009) showed that the dextral system is a 250 Myr dextral system.

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Figure 6. Unlike Coastal Cordillera, identification of possible active structures in Western Cordillera and Precordillera depression appears to have better constraints. Here we show a map created using previously mapped active structures (the Atacama Basin, blue box) and five potential target areas for further investigations (pink boxes).

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Figure 7. (a) Map of active structures in the Atacama Basin. A series of dextral strike-slip faults produce the approximately N-S trending ridge west of the Salar de Atacama in the Atacama basin. (b) A 350 Myr active system and a 250 Myr dextral system. (c) Cowen et al. (2009) showed that the dextral system is a 250 Myr dextral system.

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Figure 8. A detailed map of active structures of potential target area A. This area is located at the southeastern corner of the Atacama Basin, and has a series of reverse fault systems. These faults may be potential dating markers to determine the ages and slip rates of the structures.

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Figure 9. A detailed map of active structures of potential target area B. This area is located at the southeastern corner of the Atacama Basin, and has a series of reverse fault systems. These faults may be potential dating markers to determine the ages and slip rates of the structures.

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Figure 10. A detailed map of active structures of potential target area C. This area is located at the southeastern corner of the Atacama Basin, and has a series of reverse fault systems. These faults may be potential dating markers to determine the ages and slip rates of the structures.

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Figure 11. A detailed map of active structures of potential target area D. This area is located at the southeastern corner of the Atacama Basin, and has a series of reverse fault systems. These faults may be potential dating markers to determine the ages and slip rates of the structures.

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Figure 12. A detailed map of active structures of potential target area E. This area is located at the southeastern corner of the Atacama Basin, and has a series of reverse fault systems. These faults may be potential dating markers to determine the ages and slip rates of the structures.

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REFERENCES

- Dunai, T., J. A. González-Gómez, and J. Juez-Larre (2005), Oligocene-Miocene age of the Atacama Basin in Western Cordillera, and a series of reverse faults, and a dextral strike-slip system in its northern part. Abandoned reverse faults and dextral systems indicate that the Atacama Basin was the only segment of the suspected “Nacimiento fault” that is most likely to be active. Along this segment, a series of reverse faults are producing a series of extensional segments that form the Atacama Basin and the nearby Lago Talar. (b) Satellite image for the Atacama Basin. We suggest that the Atacama Basin has roughly the same area as shown in Figure 2b, we have identified three such relationship is, however, not easy to find. A systematic knowledge of possible active structures in Coastal Cordillera, northern Chile, J. South Am. Earth Sci., 14, 321-342.