Transition from PSAD56/SAD69 to SIRGAS. Toward a kinematic reference frame for mining in Chile

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Abstract. In February 2022, Law 21420 established that the agency that regulates mining concessions in Chile, Servicio Nacional de Geología y Minería de Chile (SERNAGEOMIN), in English, National Service of Geology and Mining of Chile, must employ SIRGAS (Sistema de Referencia Geodésico para Las Américas) since 2023 as a modern reference frame (RF). Law replaced PSAD56 (Provisorian South American Datum 1956) and SAD69 (South American Datum 1969) with SIRGAS to manage mining geospatial information in Chile. In this project, the SIRGAS geodetic processing and analysis centre of the University of Santiago (USC-SIRGAS) shows how it developed the strategy to allow SERNAGEOMIN to implement law 21420, transitioning from a classic RF to the modern RF called REDGEOMIN (Red Geodésica para Minería) which is aligned with SIRGAS. REDGEOMIN is a kinematic RF, where a deformation model called ADELA (Analysis of DEformation beyond Los Andes) has also been generated.

The classic geodetic infrastructure is highly deteriorated in Chile and doesn't have maintenance. It has poor densification and information, and the coordinates have metric errors. Military Geographic Institute must maintain the national geodetic network to generate cartography in Chile. For this reason, in 2008, it changed from PSAD56/SA69 to SIRGAS, specifically to one static densification called SIRGASChile. Because its objective is purely cartographic, the parameters obtained do not have the necessary precision for engineering and mining. This project has two motivations, the first to obtain transition parameters between both systems and the second to implement a kinematic RF that includes seismic events.

The study consists of three phases: first, calculation of REDGEOMIN-ADELA, and second, calculation of transformation parameters. By law, the parameters must maintain the mining concessions' size, shape and dimensions. The last step is the implementation of REDGEOMIN as a kinematic reference frame, leaving PSAD56-SAD69 behind.