NAD83(CSRS) Version 8: A New Realization of NAD83 for Canada based on ITRF2020 and IGS Repro3 Products

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Abstract. The North American Datum of 1983 (NAD83) is the geometric reference frame of the Canadian Spatial Reference System (CSRS) and has been adopted by the federal and provincial agencies for georeferencing in Canada. In collaboration with the U.S., NAD83 was redefined in 1998 as a seven-parameter Helmert transformation from ITRF96. The transformation parameters were effectively definitional and considered errorless. Referred to as NAD83(CSRS), the frame was kept aligned with the North American tectonic plate using the NNR-NUVEL-1A plate motion model. NAD83(CSRS) has since been updated to later realizations of ITRF using the transformations between ITRFs published by the IERS and identified by version numbers. Several realizations or versions of NAD83(CSRS) have been released based on each new realization of ITRF. The current NAD83(CSRS) version 7 is based on the transformation from ITRF2014 and was realized from a reprocessing of all continuous and high accuracy GPS campaign data up to the end of 2017 using stations in Canada, the bordering areas of the U.S., all of Greenland, and a set of approximately 80 global IGS stations for alignment to IGS14. A new NAD83(CSRS) version 8 is now under development based on the recently released ITRF2020. A fully consistent weekly reprocessing of all data up to 2022 is now being initiated with the latest version of the Bernese GNSS software, and IGS Repro3 products and processing standards. In addition, a detailed re-analysis of all station position and velocity discontinuities using MATLAB-based visualization and analysis tools is nearly complete. The weekly Bernese solutions will be combined into a final cumulative solution with and without the estimation of seasonal signals for comparison purposes. The version 8 crustal motion model will also be improved through updated GIA models and the use of 5 more years of data, resulting in more accurate velocities for the many new stations used to densify the GNSS network throughout Canada.