The area now known as the Swiss Confederation was occupied by Helvetians who were conquered by the Romans; the southwest was invaded by Burgundians, and the northeast was invaded by Alamanni. In 1291 the Forest Cantons, or provinces of Uri, Schwyz, and Unterwalden, formed an anti-Hapsburg league that became the nucleus of the Confederation. The perpetual neutrality of Switzerland was guaranteed by international agreement in 1815 at the Congress of Vienna and again in 1919 by the Treaty of Versailles. Its present constitution was adopted in 1874. The highest peak of this Federal Republic is Monte Rosa at 4,638 m (15,217 ft). The Swiss Confederation shares borders with France, Germany, Italy, Austria, and the Principality of Liechtenstein.

G. H. Dufour, later to become a general, founded the Eidgenössisches Topographisches Bureau (Topographical Bureau) in Geneva in 1838. Dufour decided to use the “carte du jour” projection of Europe for the time which was the ubiquitous Ellipsoidal Bonne originally used for topographic mapping by Cassini himself during the Napoleonic Campaigns. The grid used for this Ellipsoidal Bonne has a Latitude of Origin ($\phi_0$) = 46° 57´ 06.02˝ N, a Central Meridian ($\lambda_0$) = 7° 26´ 24.75˝ East of Greenwich (5° 06´ 10.80˝ East of Paris), a False Easting of 600 km and a False Northing of 200 km. The Berne Observatory Datum was circa 1840, and the ellipsoid used was the Schmidt 1831 where $a = 6,376,804$ m, and $1/f = 302.02$. The office was transferred to Berne in 1868, and the publication of the original surveys at 1:25,000 (Swiss Central Plains) and at 1:50,000 (Alps) with contours was performed from 1870-1916. The Old Berne Observatory Datum of 1898 published an Astronomical Latitude ($\Phi_o$) = 46° 57´ 08.66˝ N, based on observations executed by E. Plant amour in 1875 and an Astronomical Longitude ($\Lambda_o$) = 7° 26´ 22.5˝ East of Greenwich. The defining azimuth to station Rötiñfluh was ($\alpha_o$) = 11° 12´ 05.24˝. The ellipsoid height and deflection of the vertical are not defined and therefore are forced to zero at the origin.
In 1900, the national mapping agency was renamed the Eidgenössische Landestopographie. The vertical Datum was defined as Repère Pierre du Niton 1902, a large rock in the harbor of Geneva, where $H_0 = 373.600$ m (“Gebrachshöhe”) with a connection to the tide gauge in Marseilles, France. M. Rosen mund, an engineer with the bureau, developed a new projection. The new system is an oblique conformal cylindrical double projection, similar in concept to what General Jean Laborde developed for Madagascar. For the grid of the Swiss National Maps, the value $\varphi_0 = 46^\circ 57' 07.90''$ N was chosen based on more recent measurements (1937), and the Central Meridian ($\lambda_0$) = 7º 26’ 22.5” East of Greenwich. The radius of the Gaussian Sphere evaluated at the grid origin for the Bessel 1841 ellipsoid is $R = 6,378,815.9036$ m. The Grid Scale Factor at Origin ($m_o$) = 1.00072913843, and the false origin $Bessel$ 1841 ellipsoid is $R = 6,378,815.9036$ m. The Grid Scale Factor at Origin ($m_o$) = 1.00072913843, and the false origin $m_o$ = 7º 26’ 22.5” East of Greenwich. The radius of the Gaussian Sphere evaluated at the grid origin for the Bessel 1841 ellipsoid is $R = 6,378,815.9036$ m. The Grid Scale Factor at Origin ($m_o$) = 1.00072913843, and the false origin $Bessel$ 1841 ellipsoid is $R = 6,378,815.9036$ m. The Grid Scale Factor at Origin ($m_o$) = 1.00072913843, and the false origin

Meridian (harbor of Geneva, where $H_0 = 373.600$ m (“Gebrauchshöhe”) of triangulation point Gurten were kept to maintain orientation. The deflection of the vertical is now defined at Zimmerwald Zo: $\zeta_o = +2.64^\prime$, $\eta_o = +2.73^\prime$, and $H_0 = 897.8408$ m. Transforming the CH1903+ Datum the to CHTRS95 Datum (WGS84 ellipsoid) then is accomplished by $\Delta X = +674.253$ m, $\Delta Y = +015.053$ m, $\Delta Z = +405.324$ m, according to the Swiss Federal Office of Topography.

The European Datum of 1950 was computed for Switzerland by the U.S. Army Map Service in the 1950s, and to transform from EU50 to WGS84, $\Delta X = –87$ m, $\Delta Y = –96$ m, $\Delta Z = –120$ m. To transform from EU79 to WGS84, $\Delta X = –6$ m, $\Delta Y = –98$ m, $\Delta Z = –119$ m. These parameters are according to NIMA’s TR 8550.2, 3 January 2000.

According to the Swiss Federal Office of Topography, the seven-parameter Datum shift from CH1903+ to WGS84 is: $\Delta X = +660.077$ m $\pm4.055$ m, $\Delta Y = +013.551$ m $\pm4.816$ m, $\Delta Z = +369.344$ m $\pm3.914$ m, $\alpha = 2.484$ cc $\pm0.417$ cc, $\beta = 1.783$ cc $\pm1.455$ cc, $\gamma = 2.939$ cc $\pm0.411$ cc, and $M = 1.00000566 \pm0.00000052$. “Different applications of these transformation parameters, particularly in northern Switzerland, have shown that WGS84 coordinates can be computed for all of Switzerland from the national coordinates with an accuracy better than 1 meter (1 sigma).”

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**Update**

Significant geodetic activities have been performed in Switzerland since 2001, and all is reported in National Reports to the International Union of Geodesy and Geophysics (IUGG). The accuracy of the known geoid in Switzerland is considered known to better than a few centimeters, largely due to an enormous amount of observations for the deflection of the vertical (DOV). The European Reference Frame (EUREF) is supported and the country is in full cooperation with all of its neighbors.

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4. [File:///Users/cjmce/Downloads/ch1903wgs84_e.pdf](File:///Users/cjmce/Downloads/ch1903wgs84_e.pdf).

The contents of this column reflect the views of the author, who is responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the American Society for Photogrammetry and Remote Sensing and/or the Louisiana State University Center for GeoInformatics (C4G).

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**PHOTOMETRIC ENGINEERING & REMOTE SENSING**