Координатные системы и картографические проекции (в Open Source QGIS)

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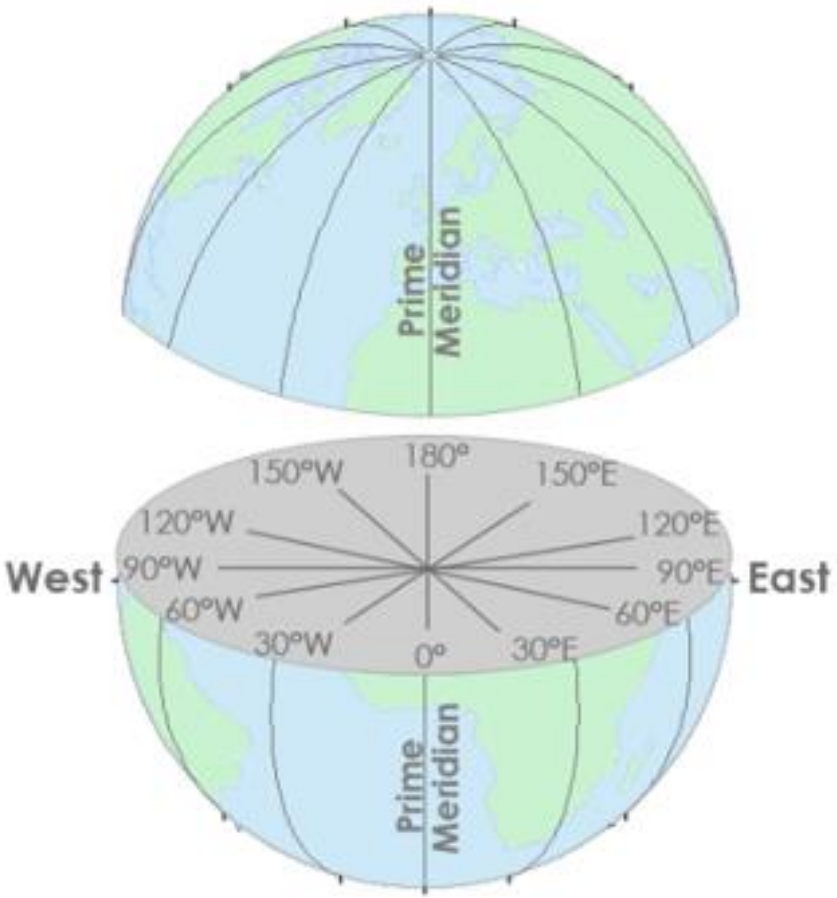
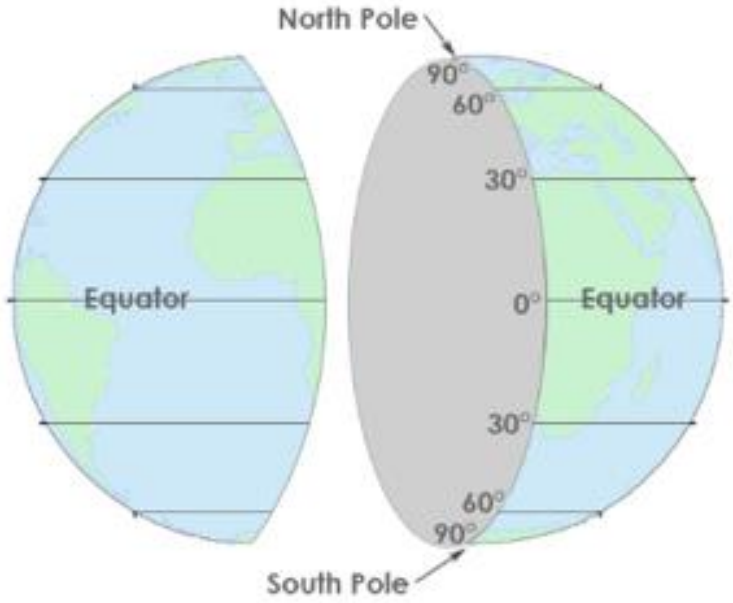
Содержание

Координатная система



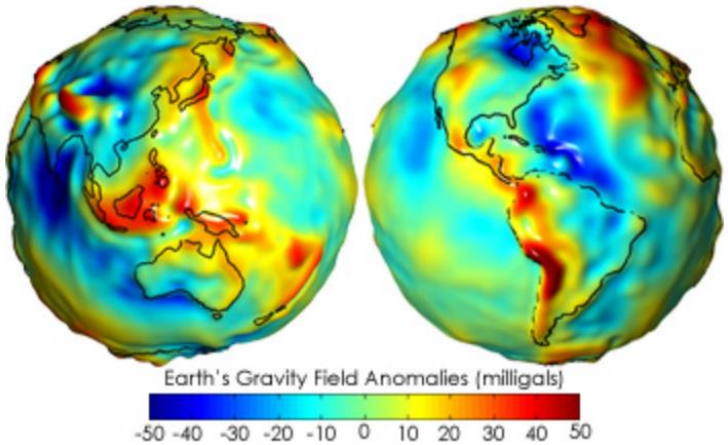
Longitude Coordinates



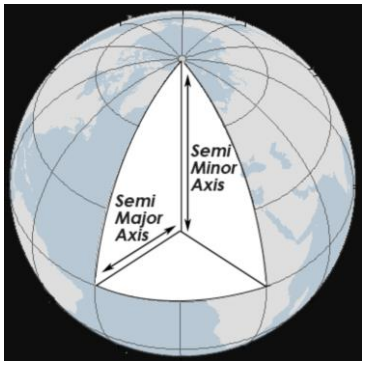
Latitude Coordinates

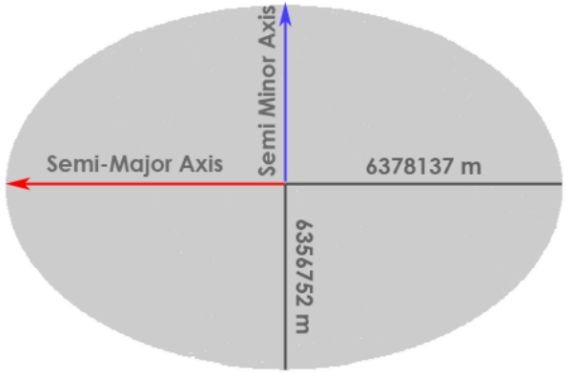
https://gisgeography.com/latitude-longitude-coordinates/

Датум



Geoid (Image courtesy of NASA/JPL)





Главная ось эллипса – это экваториальный радиус; другая ось – от центра к полюсам

Name	Year	Semi-Major Axis (Equator Radius)	Semi-Minor Axis (Polar Radius)	Users
Clarke	1866	6,378,206.4 m	6,356,583.8 m	North America
International (Hayford) Ellipsoid	1924	6,378,388.0 m	6,356,911.9 m	Most of the World
WGS72	1972	6,378,135.0 m	6,356,750.5 m	NASA
GRS80	1980	6,378,137.0 m	6,356,752.3 m	Worldwide
WGS84	1984	6,378,137.0 m	6,356,752.3 m	Current Worldwide

https://gisgeography.com/ellipsoid-oblate-spheroid-earth/
https://gisgeography.com/geodesy/

ГИС-определение картографической проекции

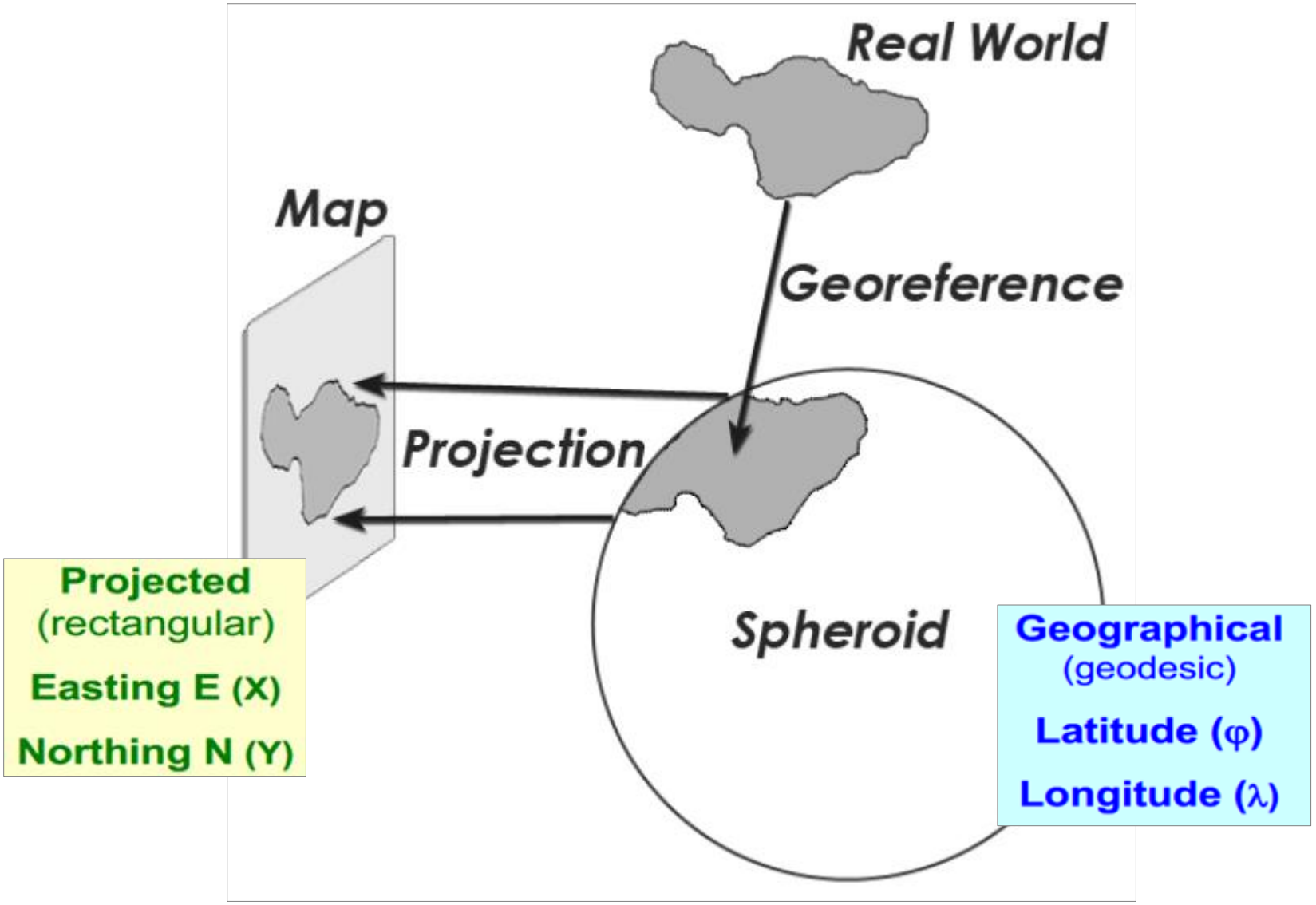
Картографическая проекция – это метод, при помощи которого картографы представляют сферу или глобус на плоскости

https://gisgeography.com/map-projections/

- Любая картографическая проекция обладает рядом искажений (углы, расстояния, площади)
- Координатная референцная система (CRS) определяет при помощи координат каким образом спроектированная карта связана с реальным положением объектов на местности
- ***On the Fly*** перепроектирование – ГИС-функция, которая позволяет осуществить наложение слоев в разных координатных системах или проекциях

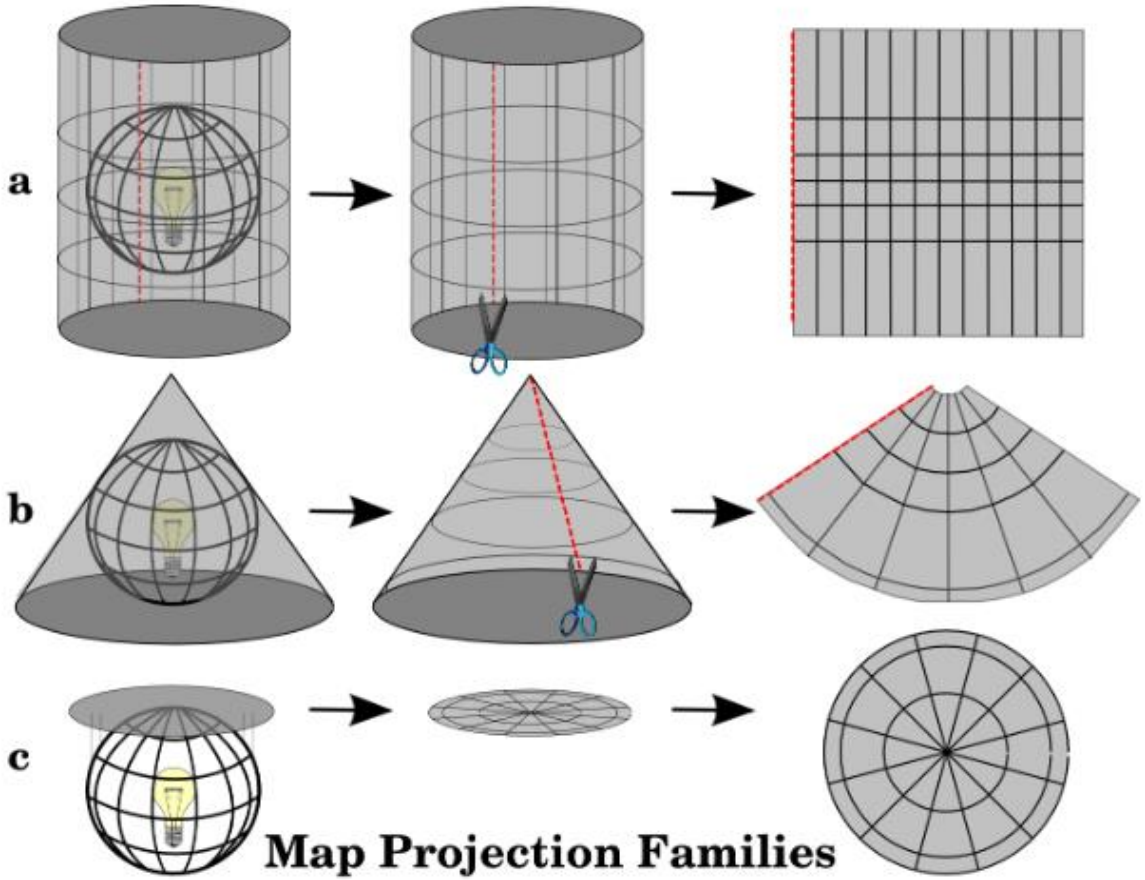
https://docs.qgis.org/testing/en/docs/gentle_gis_introduction/coordinate_reference_systems.html

Картографическая проекция: преобразование в прямоугольные координаты



https://gisgeography.com/map-projections/

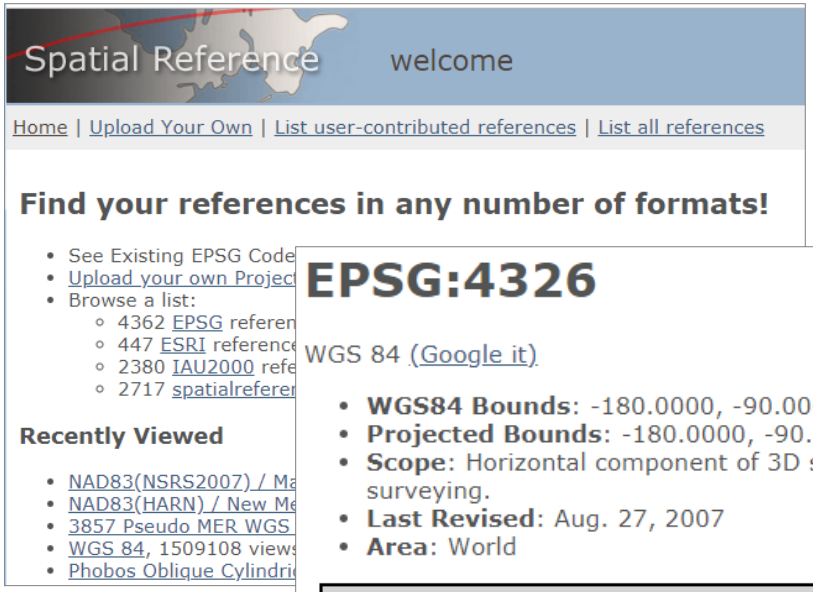
Типы картографических проекций



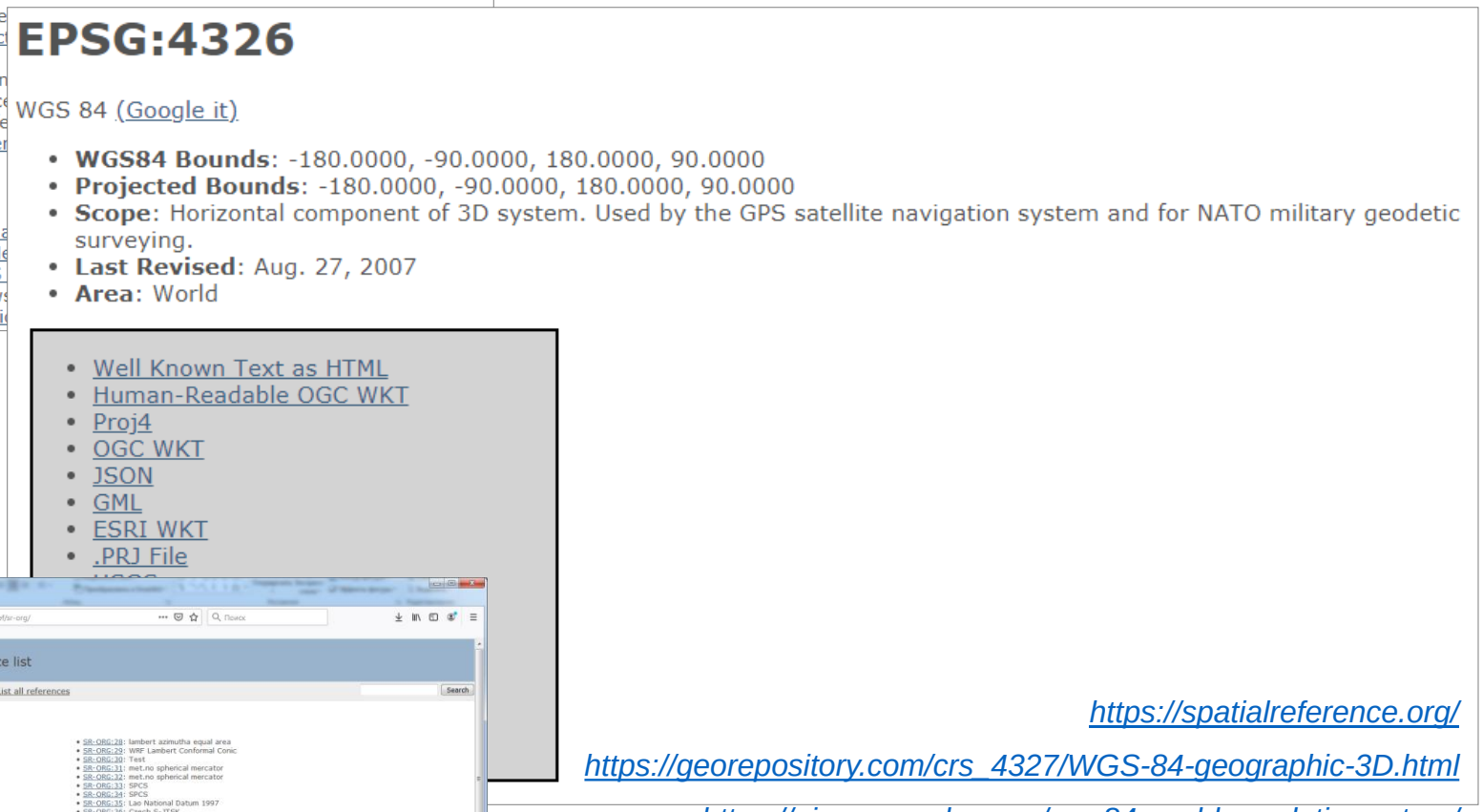
The three families of map projections. They can be represented by a) cylindrical projections, b) conical projections or c) planar projections.

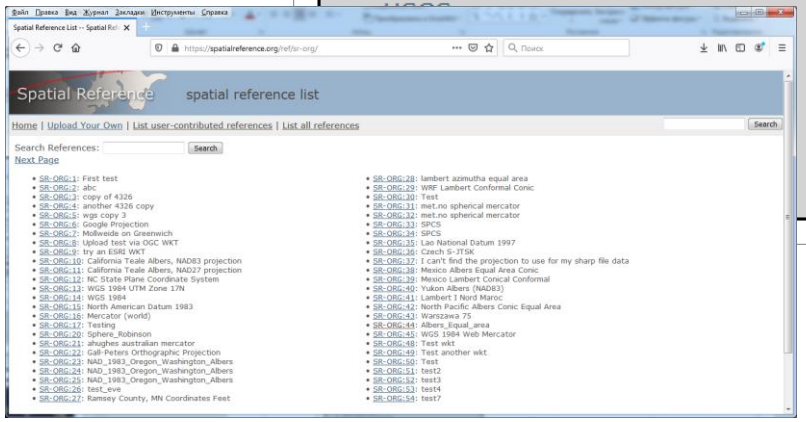
https://docs.qgis.org/testing/en/docs/gentle_gis_introduction/coordinate_reference_systems.html

Международные каталоги пространственных ссылок



World Geodetic System 1984 (WGS84)



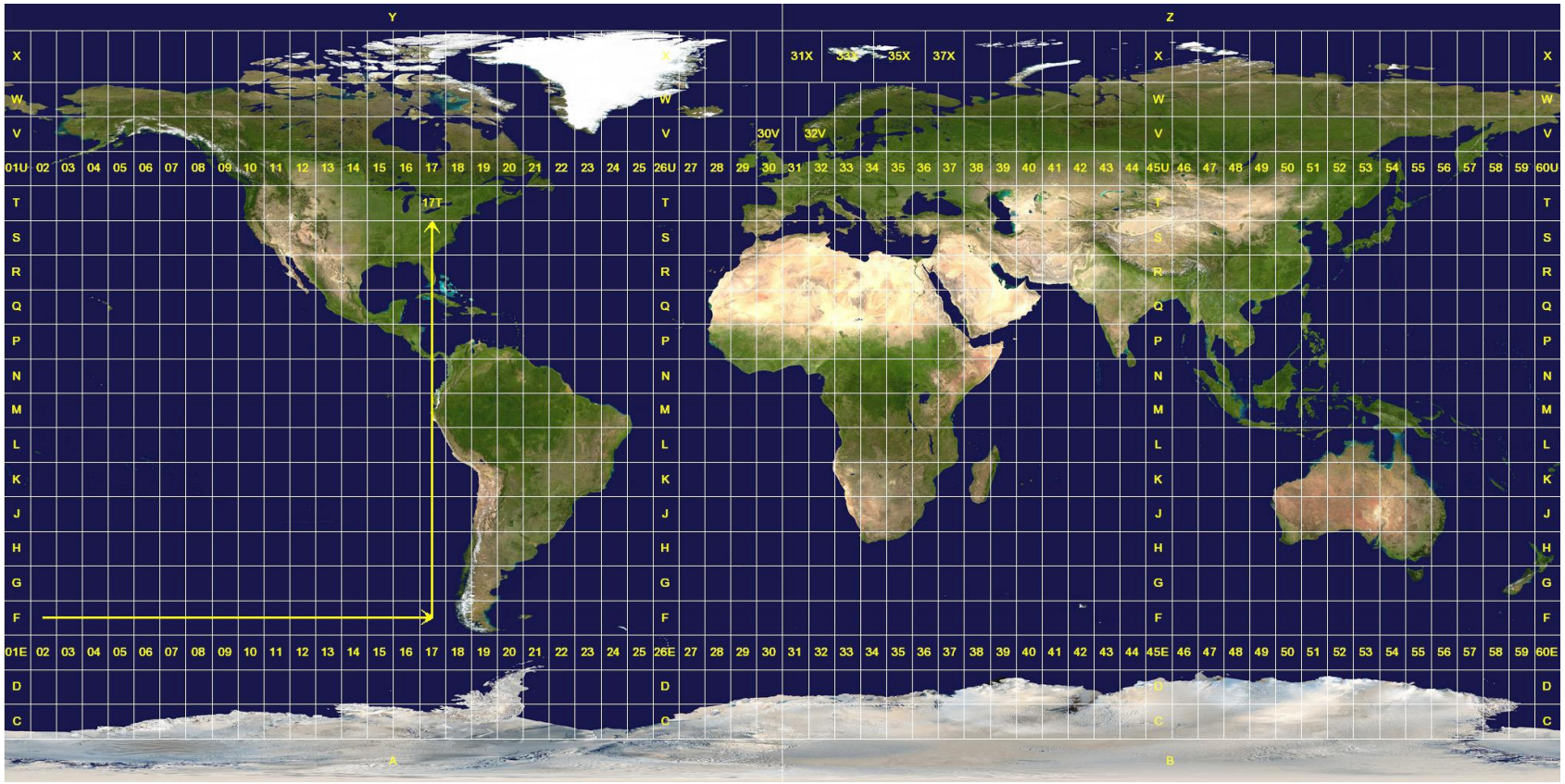


https://spatialreference.org/

https://georepository.com/crs_4327/WGS-84-geographic-3D.html

https://gisgeography.com/wgs84-world-geodetic-system/

Universal Transverse Mercator: пример картографической проекции

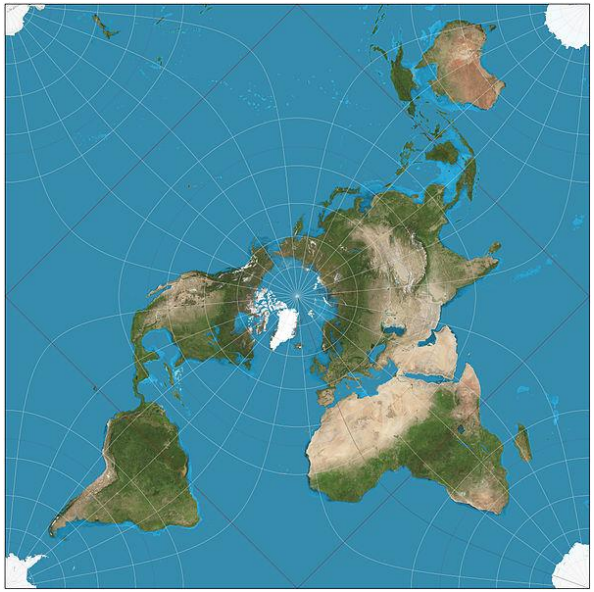


https://en.wikipedia.org/wiki/Universal_Transverse_Mercator_coordinate_system#/media/File:Utm-zones.jpg

Проекция Меркатора была предложена в 1569 фламандским картографом Gerardus Mercator

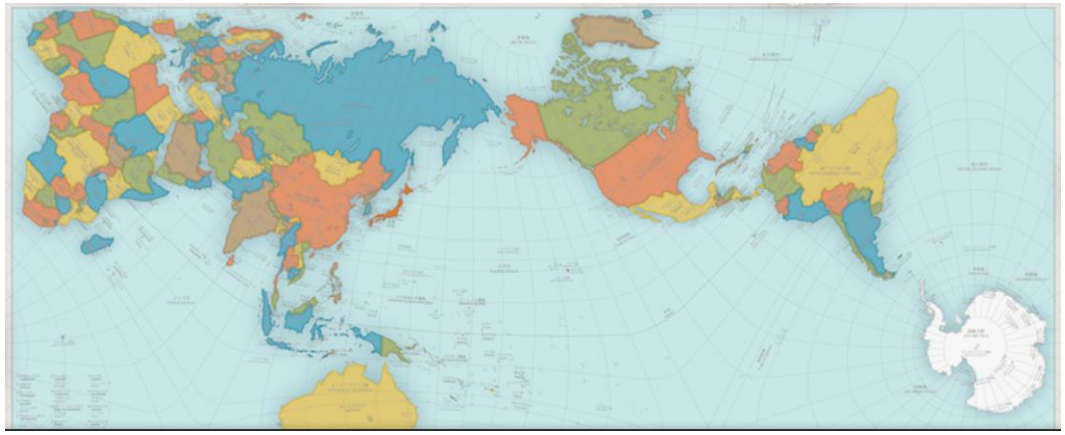
https://www.gislounge.com/look-mercator-projection/

Картографические проекции и сетки меридианов и параллелей



Peirce Quincuncial projection SW 20W

https://en.wikipedia.org/wiki/File:Peirce_quincuncial_projection_SW_20W.JPG



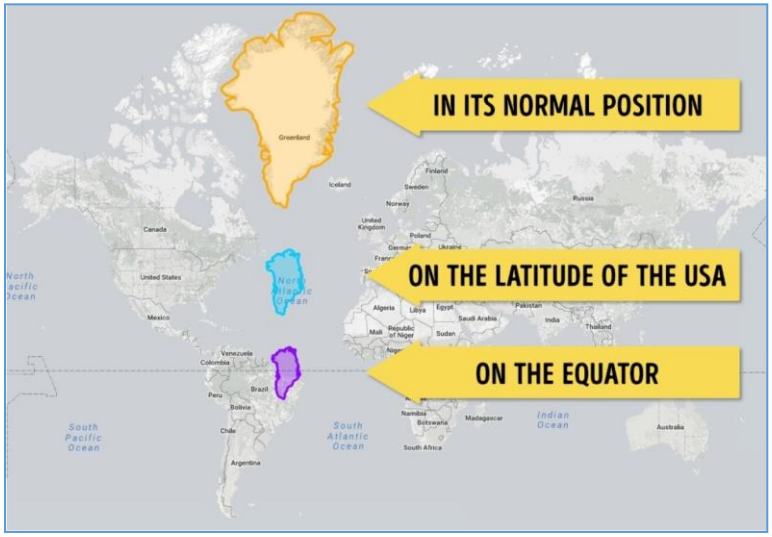
AuthaGraph World Map

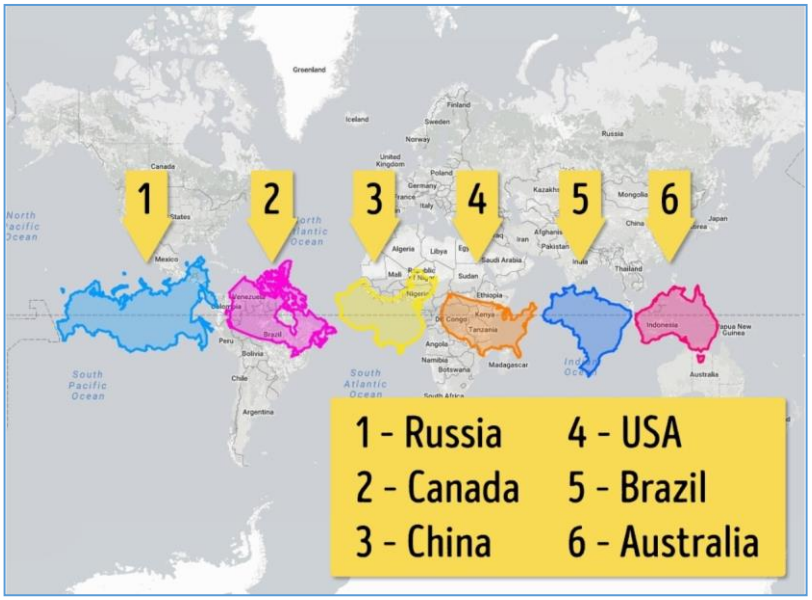
http://www.authagraph.com/top/?lang=ja

https://interestingengineering.com/not-new-earth-authagraph-map-accurate-real-view

Искажения картографических проекций

Гренландия



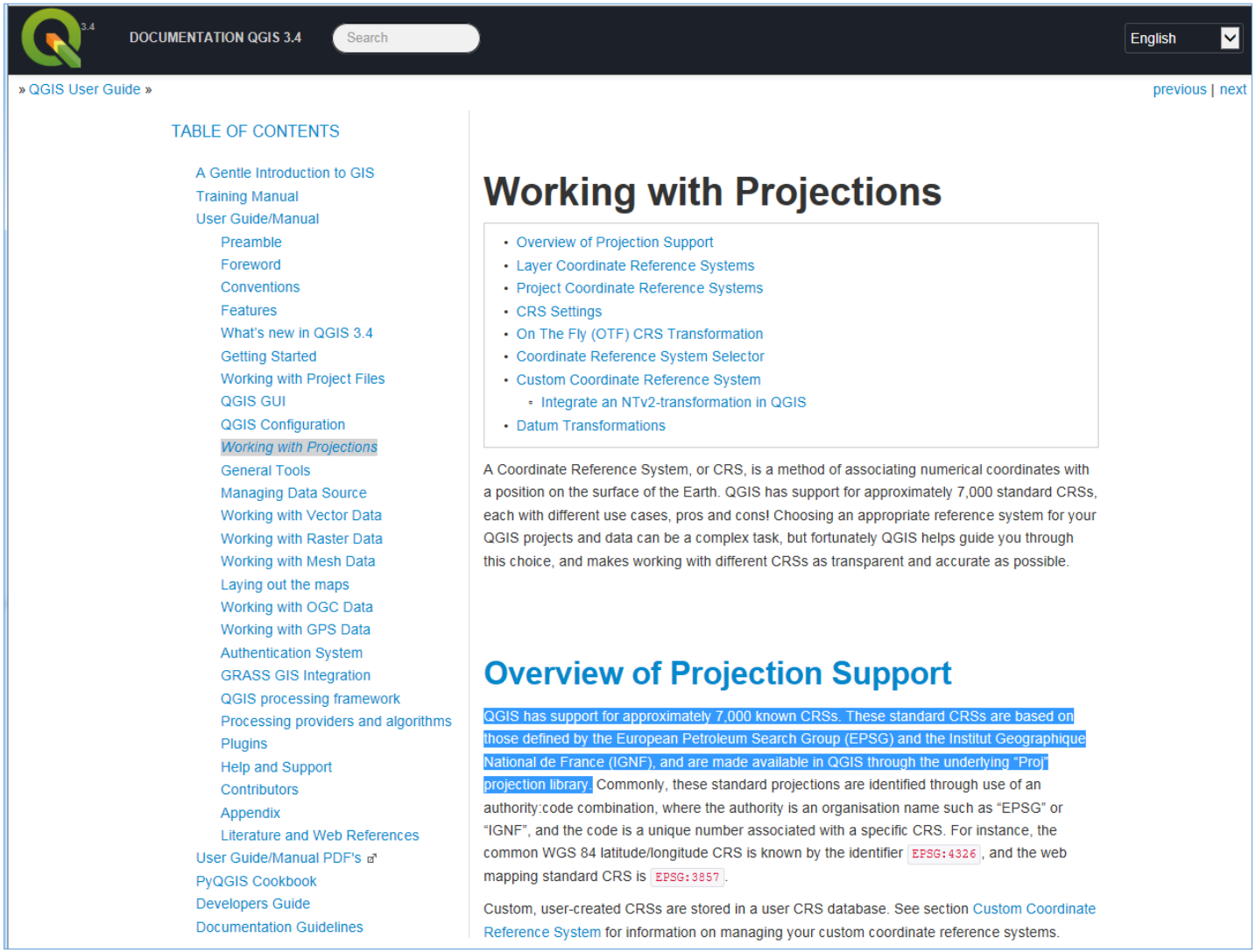


Австралия

https://thetruesize.com/#?borders=1~!MTY2NjkzNDg.NjIxNDM5*MzYwMDAwMDA(MA~!GL*MTAyMzA5NTg.MTUyNjUwNA)Mw

http://monde-geospatial.com/12-maps-that-will-change-your-understanding-of-the-world-forever/

Принципы работы с координатами в QGIS

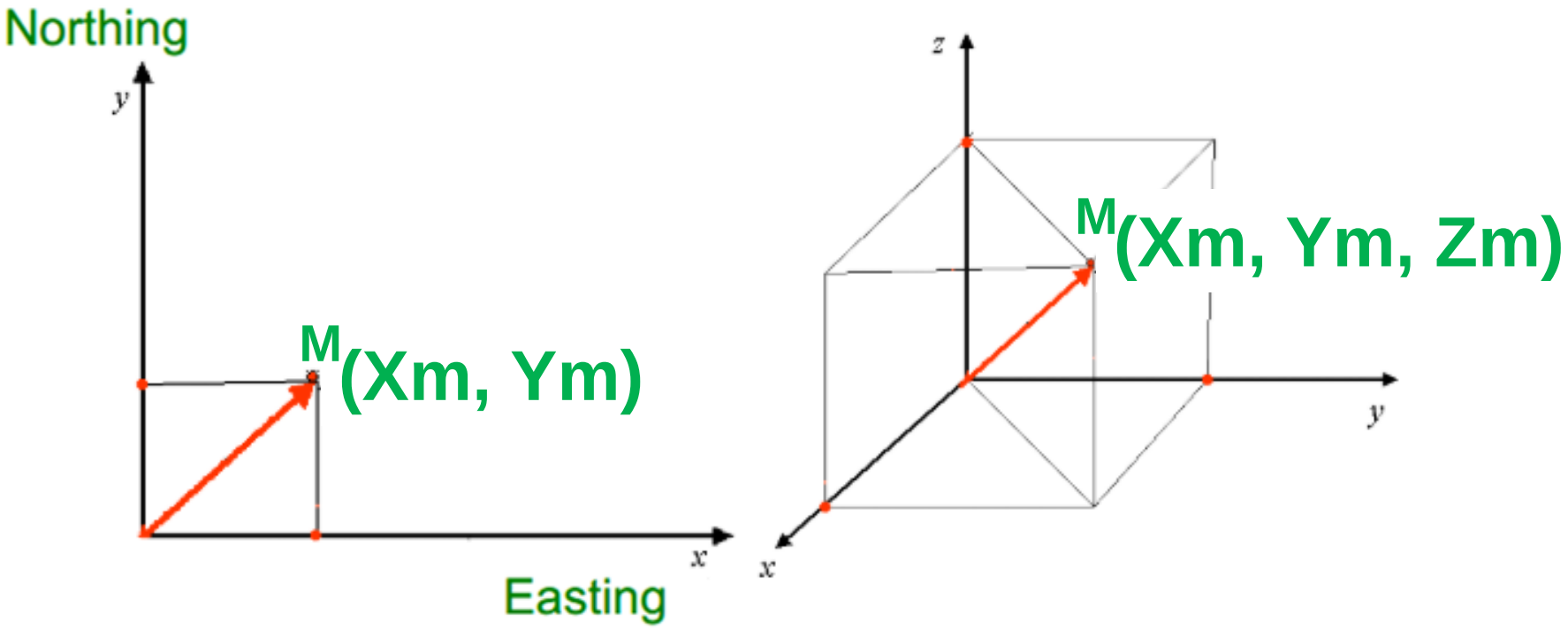


https://docs.qgis.org/3.4/en/docs/user_manual/working_with_projections/working_with_projections.html

https://www.gislounge.com/working-with-coordinate-reference-systems-mastering-qgis/

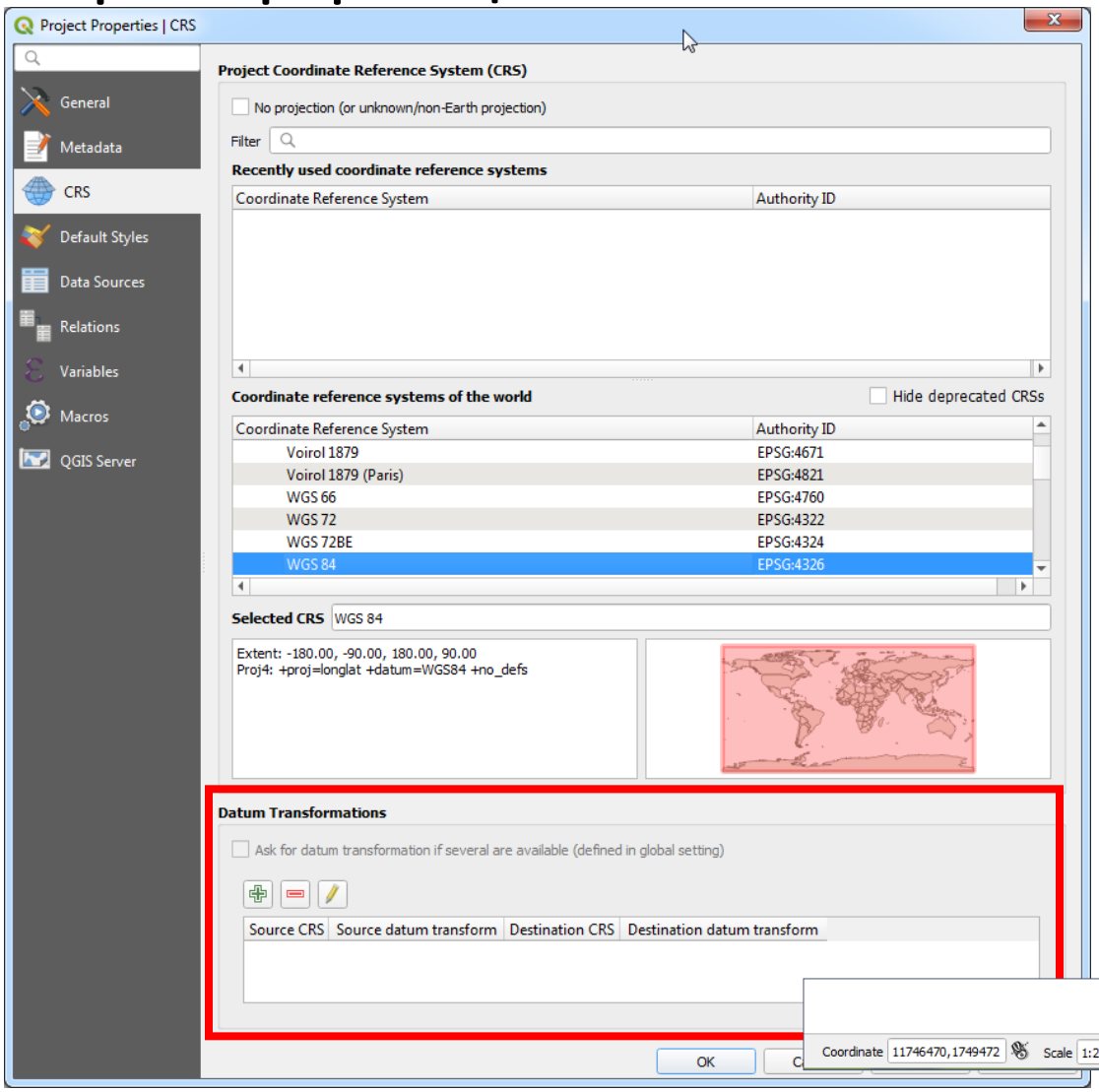
https://www.qgistutorials.com/en/docs/working_with_projections.html

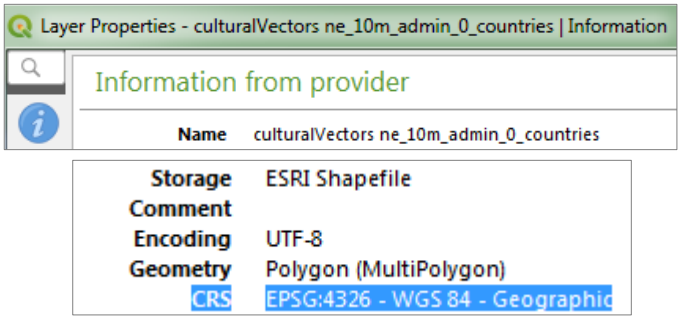
Каким образом QGIS определяет положение объекта

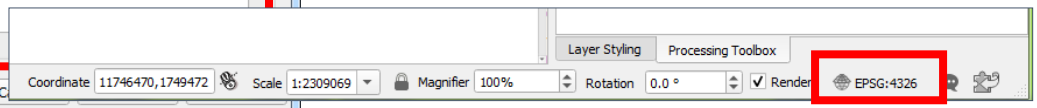


Two and three dimensional coordinate reference systems

Информация о проекции/координатной системе и трансформациях



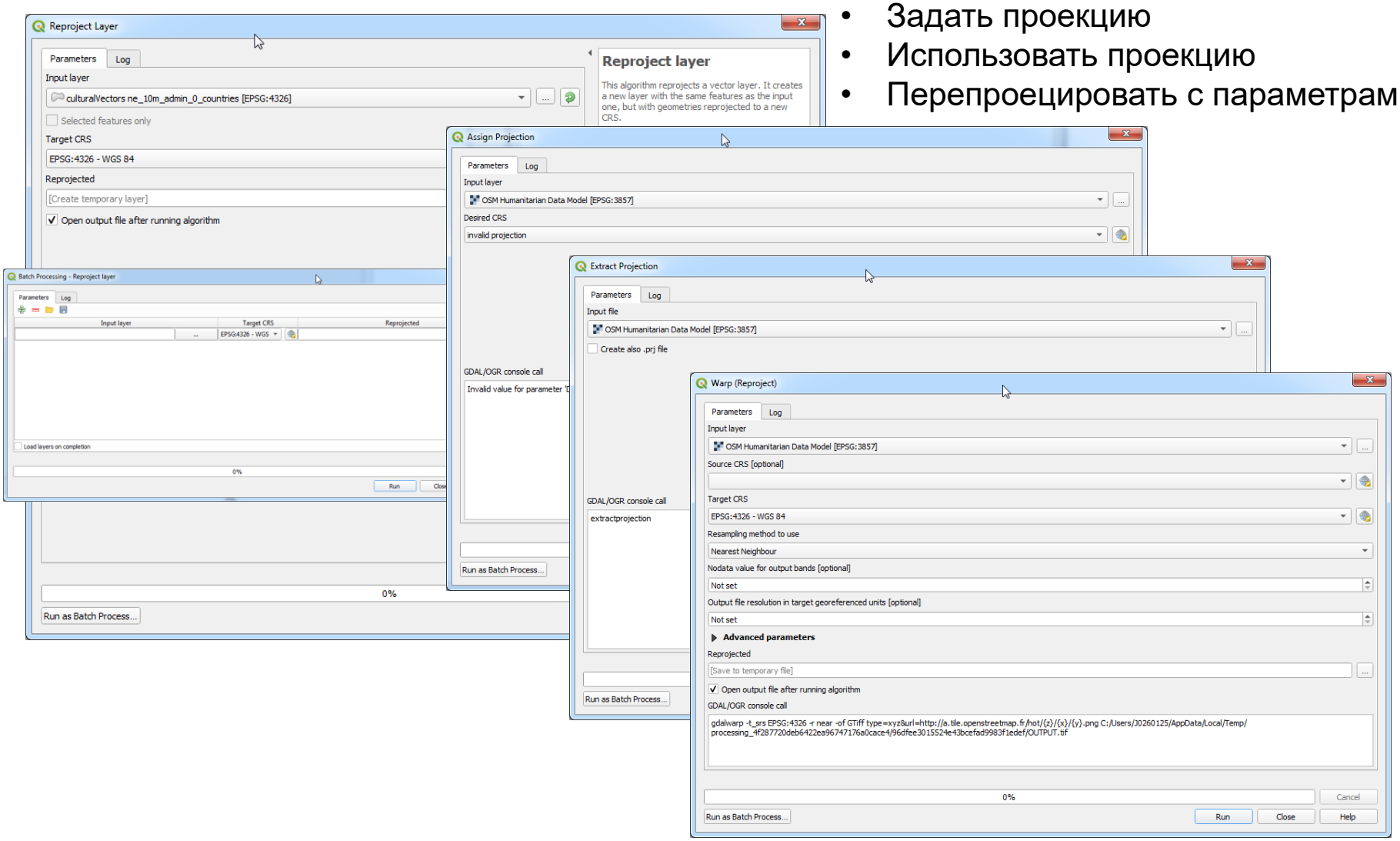




https://docs.qgis.org/3.4/en/docs/user_manual/working_with_projections/working_with_projections.html
https://docs.qgis.org/3.4/en/docs/user_manual/working_with_projections/working_with_projections.html#datum-transformations

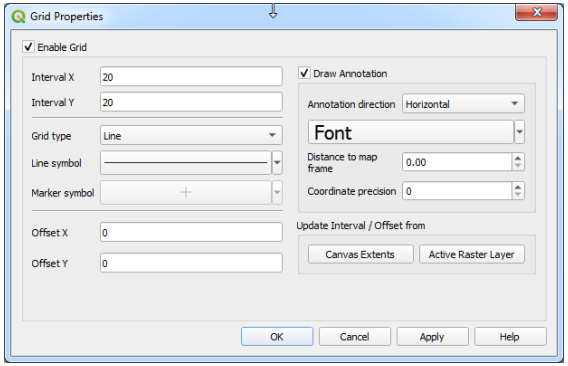
Изменение картографической проекции/ координатной системы

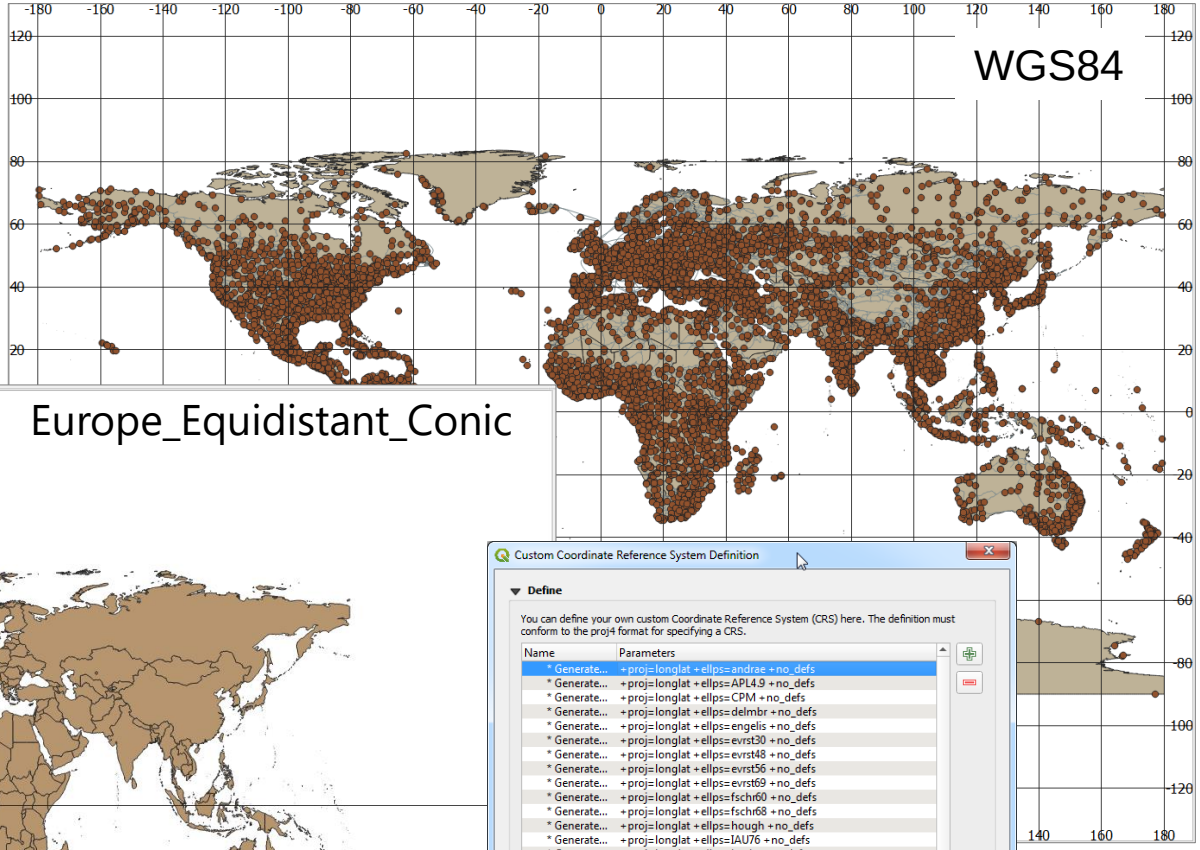
- Перепроецировать слой
- Задать проекцию
- Использовать проекцию
- Перепроецировать с параметрами

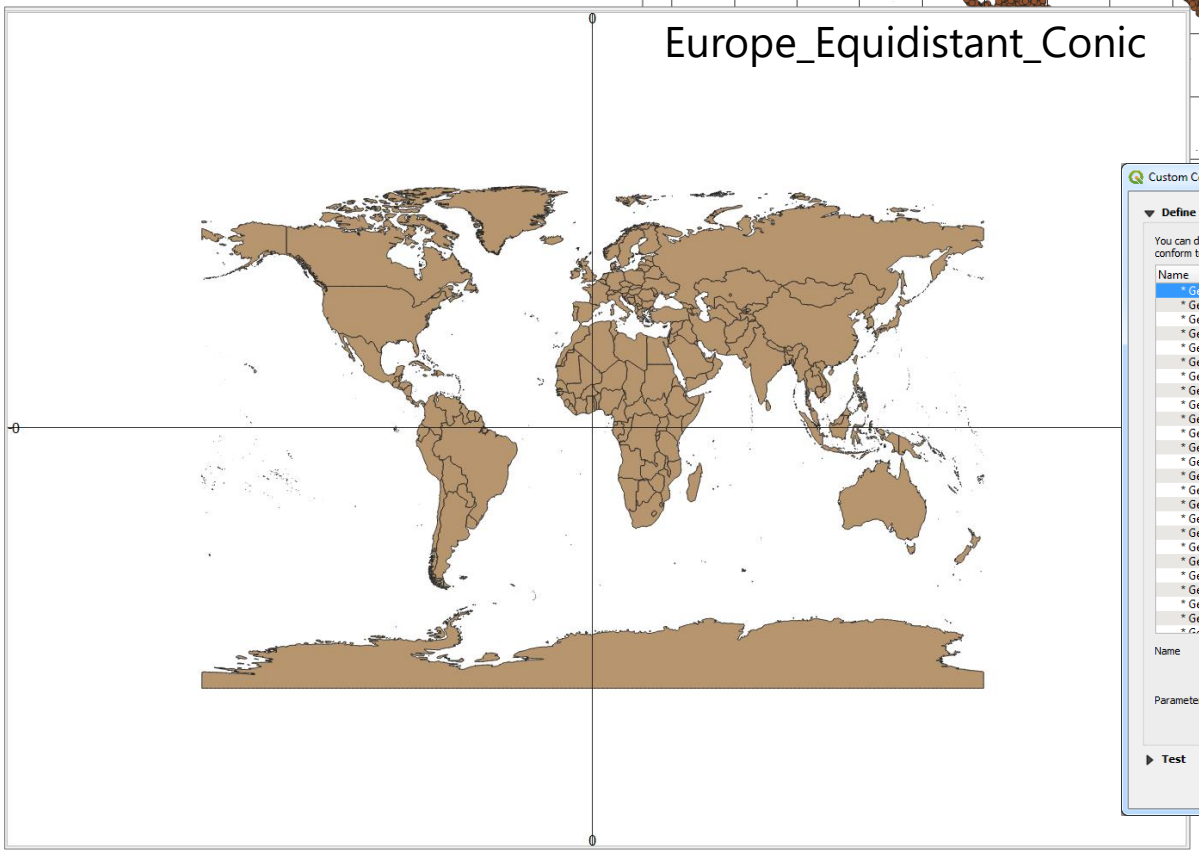


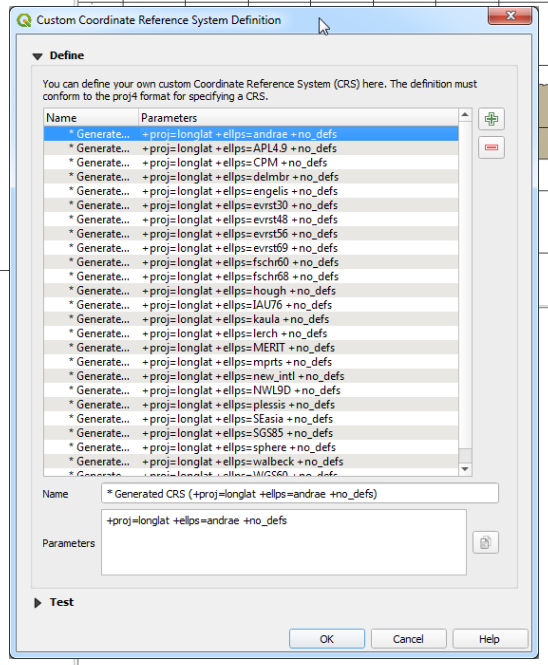
https://www.gislounge.com/how-to-change-the-projection-of-a-shapefile-using-qgis/

Сетки меридианов и параллелей в QGIS









Набор инструментов для обработки

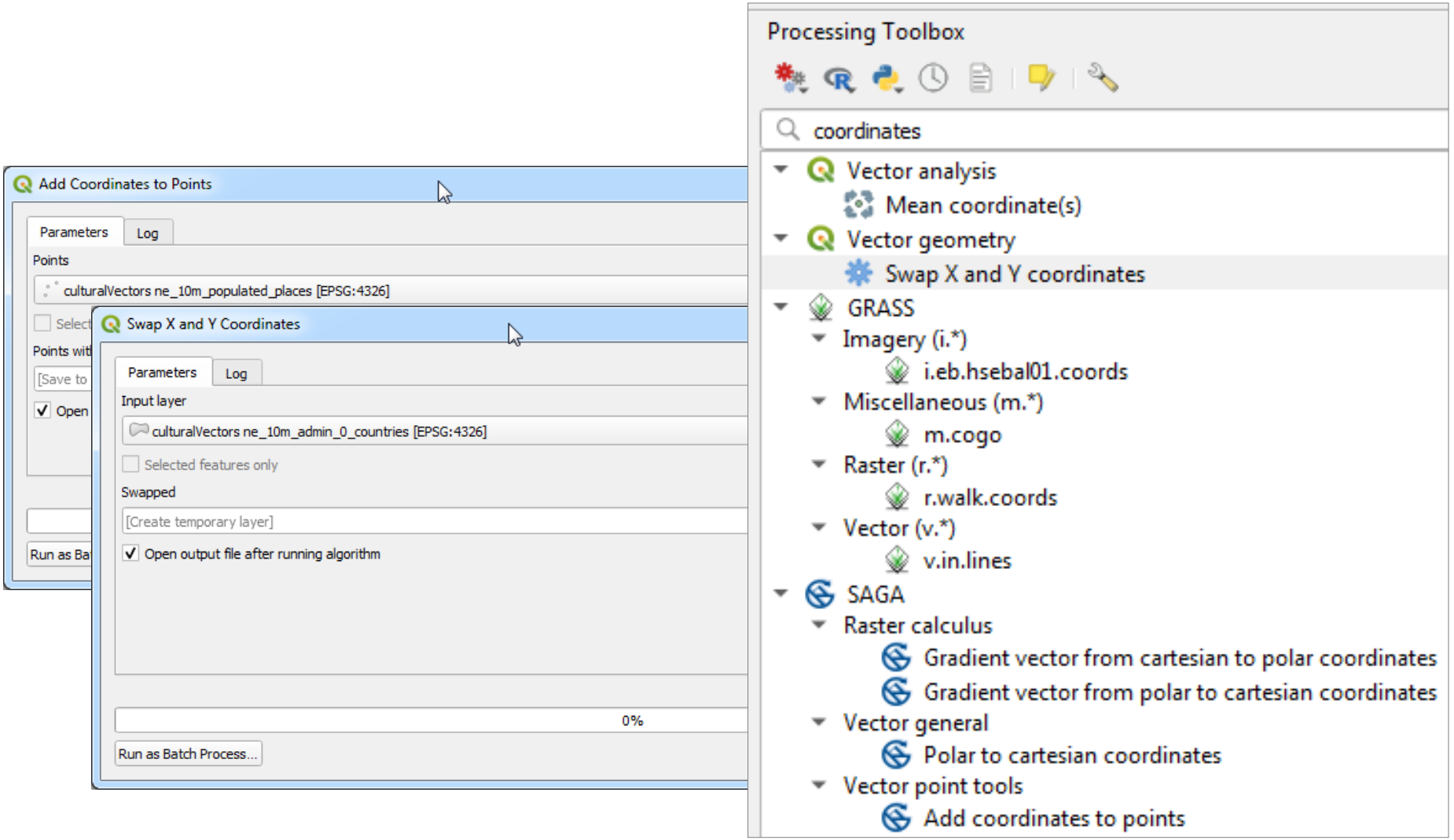
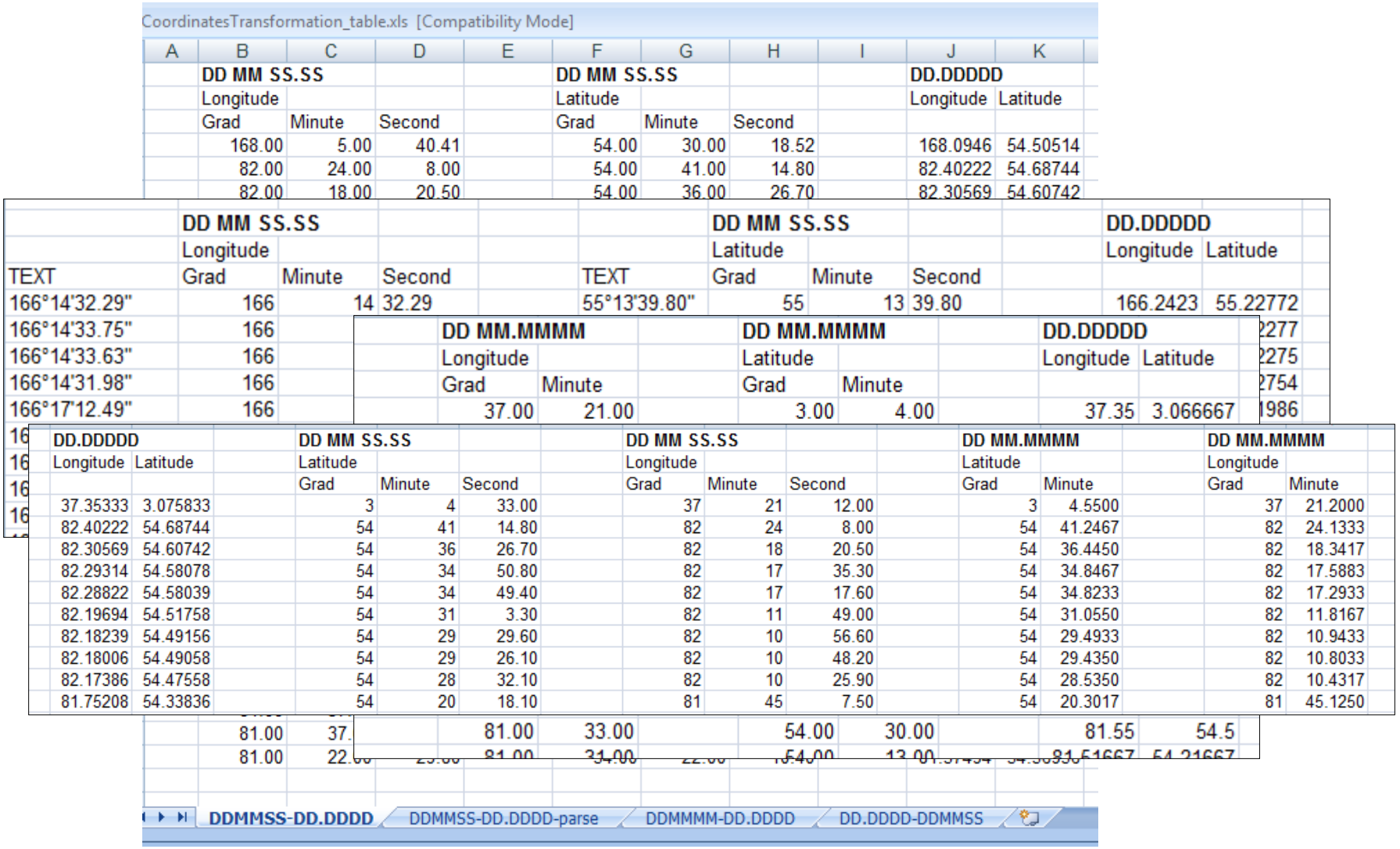


Таблица для преобразования вида географических координат “decimal degrees” – “degrees minutes seconds”



CoordinatesTransformation_table.xls [Compatibility Mode]

	DD MM SS.SS			DD MM SS.SS			DD.DDDD	
	Longitude			Latitude			Longitude	Latitude
	Grad	Minute	Second	Grad	Minute	Second		
	168.00	5.00	40.41	54.00	30.00	18.52	168.0946	54.50514
	82.00	24.00	8.00	54.00	41.00	14.80	82.40222	54.68744
	82.00	18.00	20.50	54.00	36.00	26.70	82.30569	54.60742

	DD MM SS.SS				DD MM SS.SS				DD.DDDD	
	Longitude				Latitude				Longitude	Latitude
TEXT	Grad	Minute	Second	TEXT	Grad	Minute	Second			
166°14'32.29"	166	14	32.29	55°13'39.80"	55	13	39.80		166.2423	55.22772
166°14'33.75"	166									2277
166°14'33.63"	166									2275
166°14'31.98"	166									2754
166°17'12.49"	166									1986

	DD MM.MMMM		DD MM.MMMM		DD.DDDD	
	Longitude		Latitude		Longitude	Latitude
	Grad	Minute	Grad	Minute		
	37.00	21.00	3.00	4.00	37.35	3.066667

DD.DDDD		DD MM SS.SS			DD MM SS.SS			DD MM.MMMM		DD MM.MMMM	
Longitude	Latitude	Latitude			Longitude			Latitude		Longitude	
		Grad	Minute	Second	Grad	Minute	Second	Grad	Minute	Grad	Minute
37.35333	3.075833	3	4	33.00	37	21	12.00	3	4.5500	37	21.2000
82.40222	54.68744	54	41	14.80	82	24	8.00	54	41.2467	82	24.1333
82.30569	54.60742	54	36	26.70	82	18	20.50	54	36.4450	82	18.3417
82.29314	54.58078	54	34	50.80	82	17	35.30	54	34.8467	82	17.5883
82.28822	54.58039	54	34	49.40	82	17	17.60	54	34.8233	82	17.2933
82.19694	54.51758	54	31	3.30	82	11	49.00	54	31.0550	82	11.8167
82.18239	54.49156	54	29	29.60	82	10	56.60	54	29.4933	82	10.9433
82.18006	54.49058	54	29	26.10	82	10	48.20	54	29.4350	82	10.8033
82.17386	54.47558	54	28	32.10	82	10	25.90	54	28.5350	82	10.4317
81.75208	54.33836	54	20	18.10	81	45	7.50	54	20.3017	81	45.1250

81.00	37.		81.00	33.00		54.00	30.00	81.55	54.5
81.00	22.		81.00	31.00		54.00	13.00	81.51667	54.21667

DDMMSS-DD.DDDD | DDMMSS-DD.DDDD-parse | DDMMMM-DD.DDDD | DD.DDDD-DDMMSS

http://gis-lab.info/qa/dms2dd.html
https://www.fcc.gov/media/radio/dms-decimal

Ссылки

- http://gis-lab.info/qa/proj-sk-faq.html
- https://www.gislounge.com/map-single-coordinate-using-qgis/
- https://www.sigterritoires.fr/index.php/en/how-to-find-the-coordinates-system-of-a-layer-in-qgis/
- https://www.sigterritoires.fr/index.php/en/tutorials/qgis-tutorials/
- https://www.sigterritoires.fr/index.php/comment-trouver-le-systemes-de-coordonnees-dune-couche-dans-qgis/
- https://itsleeds.github.io/QGIS-intro/working-with-qgis.html