Comparison of 3-D numeric data models

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GlS has come to in to use three-dimensionally, in order to show the position accurately. The data of three-dimensional geographical features is made now by various techniques. Models are compared and the domination of the technique is evaluated. The main numeric model that shows the shape of surface of the ground has the following three. Altitude data called DEM. DSM that models surface shape under specific condition from acquired high-density data filtered. It is DTM that similarly models geographical features selected from high-density data specifying it. 90mDEM acquired in SAR of the east and west about 10km and the south north about 6km around Echigo-Kawaguchi in Niigata Prefecture in this text. 50m DEM of GSI(Geographical Survey Institute). and, 5m-50m DTM made by LiDAR DATA. Three were processed to the same coordinates and compared. When the altitude value of 50m lattices was made from the altitude value of each data and the standard deviation of the mean value, the mean value of each difference, and each difference was calculated, it obtained as a method like Table-1. Table-2 was separated highlands and flat ground by same method.

Table-1 Comparison of difference of elevation of the each numeric character data(m) [whole area]

Sample	SAR	GSI	LiDAR			
25531	90m DEM	50m DEM	50m DTM	SAR-GSI	GSI-LiDAR	LiDAR-SAR
SUM	4176760	4060053	4105681	116707.07	-45627.87	-71079.21
AVERAGE	163.60	159.02	160.81	4.57	-1.79	-2.78
STDEV				8.03	5.36	9.47

Table-2 Comparison of difference of elevation of the each numeric character data(m) [highlands & flat-ground]

Sample	highlands 15134			flat-ground 10397		
	SAR-GSI	GSI-LiDAR	LiDAR-SAR	SAR-GSI	GSI-LiDAR	LiDAR-SAR
SUM	80929.25	-24155.88	-56741.90	35777.82	-21465.66	-14312.16
AVERAGE	5.35	-1.60	-3.75	3.44	-2.06	-1.38
STDEV	9.23	6.02	11.25	5.65	4.19	5.71

Moreover, it processed, Figure-1 was made, and shape was compared with IN-YOU-ZU(positive and negative map) introduced by [[Y05-007] The fine geographical feature expression technique of the 3-dimensional data by LiDAR] in 2005.

Result

1. Table-1 seems to have received the influence of the slope of mountain from elevation average of SAR 50m DEM higher than GSI 50m DEM and LiDAR 50m DTM.

2. The difference has been understood from the standard deviation of each difference of elevation. SAR is large, GSI is in the middle and LiDAR is small.

3. As for minute geographical features, LiDAR is good and it is understood to express it of the same 50m lattice from Figure-1-2 positive and negative charts(IN-YOU-ZU). However, SAR 50mDEM is seen to express geographical features in the bottom of a ravine in detail while GSI 50mDEM shows the ridge line in detail when Figure-1-3 GSI 50mDEM is compared with Figure-1-4 SAR 50mDEM.

4. Table-2 saw differences at highlands and flat-ground. The standard deviation of each difference can be looked flat-ground will become smaller than highlands.

5. It was difference in the shape expressed by the density of former data though compared by the same data at intervals.

(SAR 90mDEM used the data of NASA by space shuttle surveyed in 2000. GSI 50mDEM used data of Geographical Survey Institute)

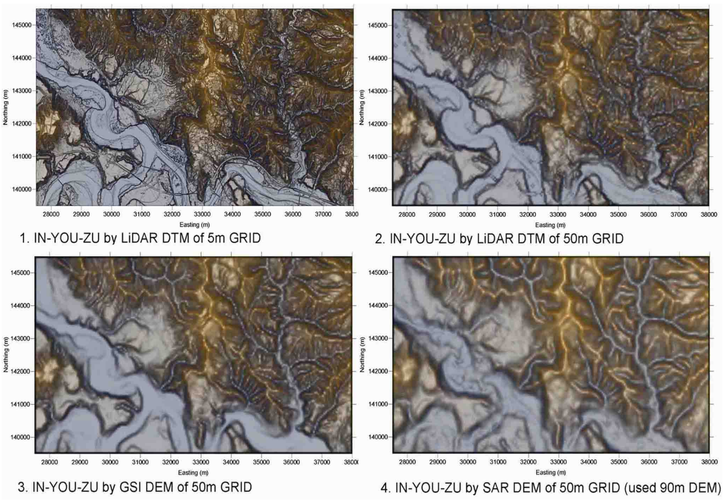

Fig-1 (-1, -2, -3, -4) 3-D MAPS