

Evaluating the accuracy of Spaceborne SAAB DSM for use in planning seismic acquisition survey in South Oman

Author:

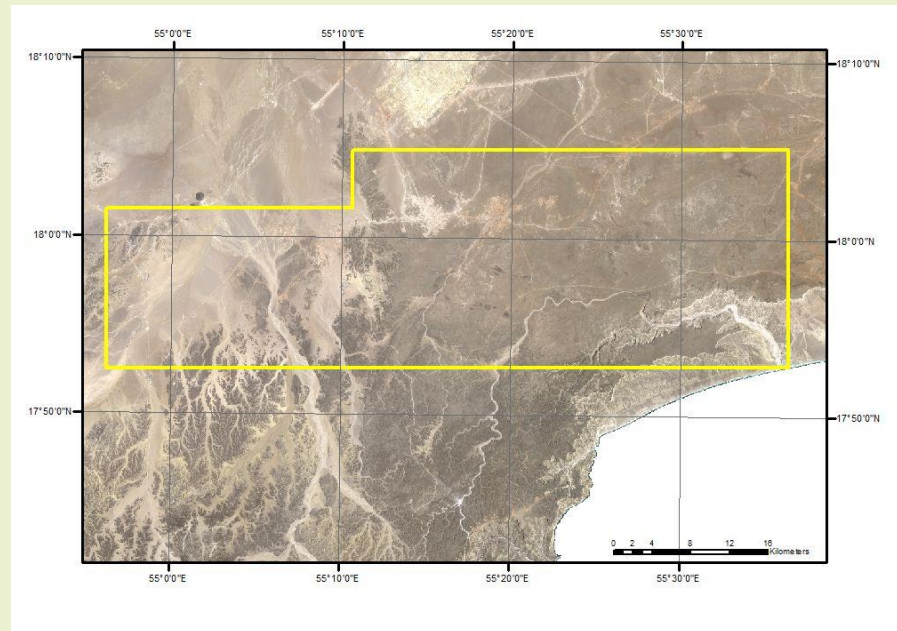
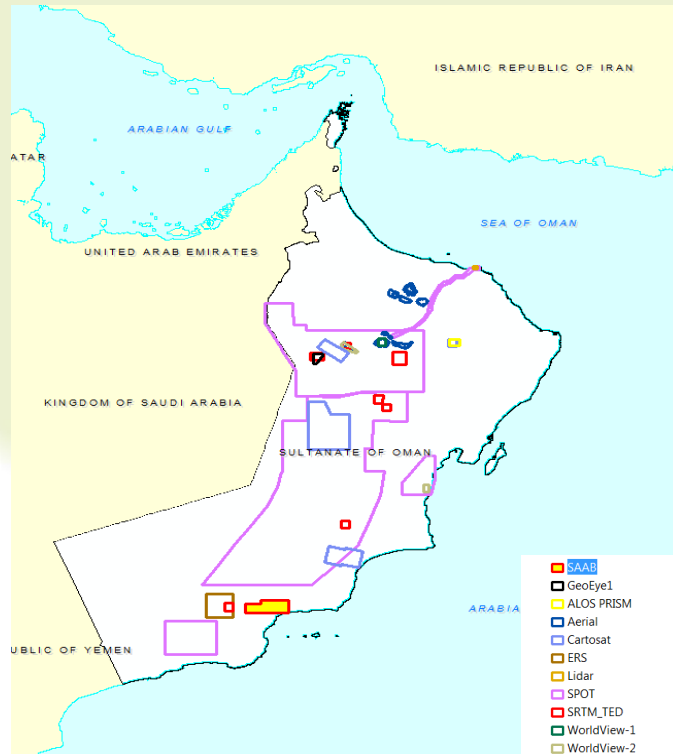
*Salim Al Harthy, Head of Remote Sensing,
PDO Geomatics Department*

Overview

- 1- Business Case
- 2- What is SAAB Technique?
- 3- SAAB Product Information
- 4- Dataset used in the evaluation
- 5- Evaluation Part (SAAB DSM)
- 6- DEM Applications & Uses in PDO
- 7- Conclusion

Business Case:

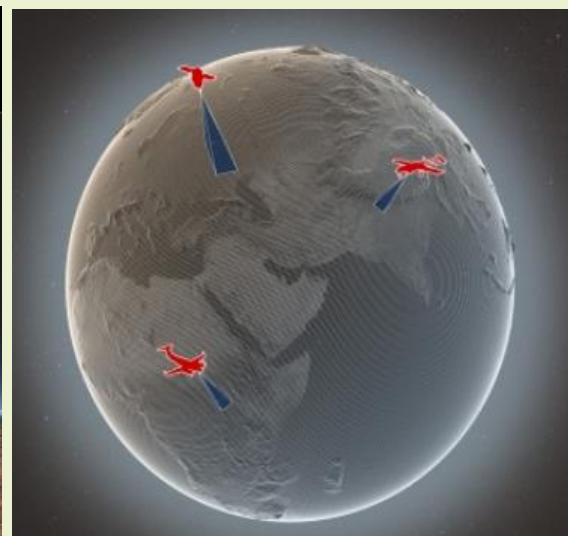
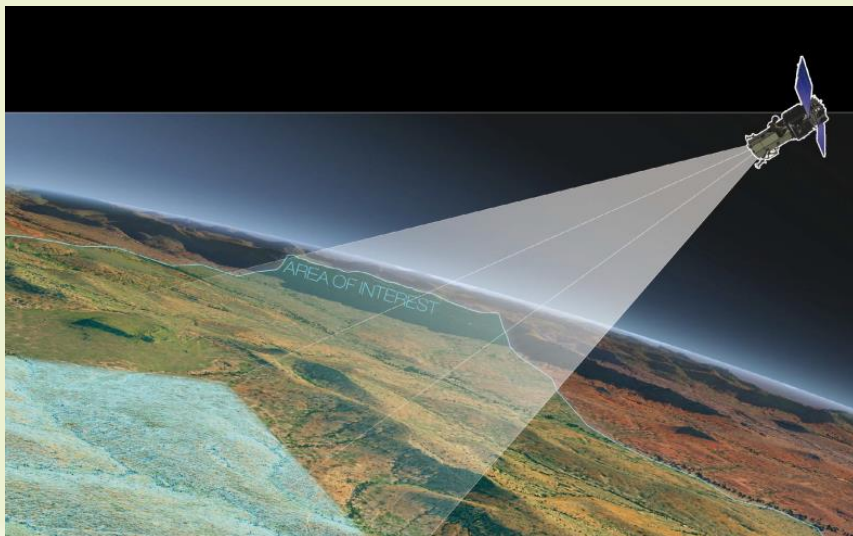
- How do you rapidly get a fit for purpose DSM for a large 3D seismic survey (>14,00km²) in an area of very harsh rocky terrain with significant operational and HSE challenges?
- This presentation will show how PDO Geomatics has added value to the project by deploying its expertise in finding a fit for purpose solution by evaluating and deliver a SAAB DSM on time and at significantly lower cost.



1 Meter \$146,100 >45 days

What is SAAB Technique?

SAAB uses multiply redundant scenes (several scenes over the same area), to attain the necessary look angles to ‘simulate’ a stereo like view (high resolution geospatial 3D data) based on Digital Globe satellite imagery (tasked or archived) which allows the customers to deploy it in a variety of applications.



No Ground Control Points required to generate DSM

SAAB DSM Product Information and Deliverables & Cost/Time Comparison with Other DSM

Product Accuracy		
Product Accuracy	Precision Product	Base Product
Resolution	2m	2m
Rel Vert LE90	1m	*)
Abs Vert LE90	3m	*)
Rel Hor CE90	2m	*)
Abs Hor CE90	3m	*)

*) Base Product will vary depending on the imagery available in the archive and terrain properties

Product Deliverables	
DSM	GeoTIFF 32-bit signed floating point file format
Projection and Horizontal Datum	UTM (WGS84/ITRF2008)
Vertical Datum	Ellipsoid Height
Minimum Order Size	100 km ²

Note: Additional projections, datum and ellipsoids are available on request

Order Delivery Time	
Size of AOI	Precision & Base Products
100 – 10,000 km ²	15 Days
Greater than 10,000 km ²	Custom quote

Source Type	Resolution	Price	Estimated tasking
Sat A DSM	1 Meter	\$146,100	>45 days
Sat B DSM	4 Meter	\$73,050	5-6 weeks
SAAB DSM	2 Meter	\$79,900	1-2 weeks

Study Area & Data Used in the Evaluation of SAAB DSM

Vector Data (Points)

1



***Trig Stations (318Points) (Ellipsoidal – PHD93)**

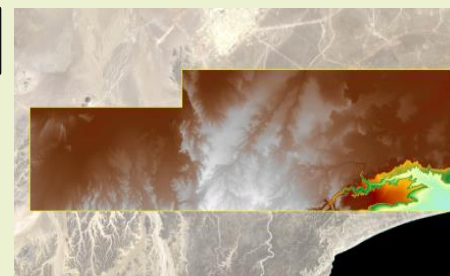
2



***TED Data (480840 Points) (PHD93)**

Raster Data (Pixels)

3

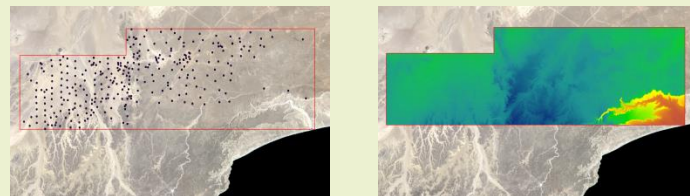


Spaceborne

SAAB DSM 2 Metre (Ellipsoidal)

- TED= Terrain Elevation Database derived from seismic surveys
- Trig Stations= Survey Ground Control Points

Difference Between Trig Stations With SAAB DSM in Ellipsoidal Height



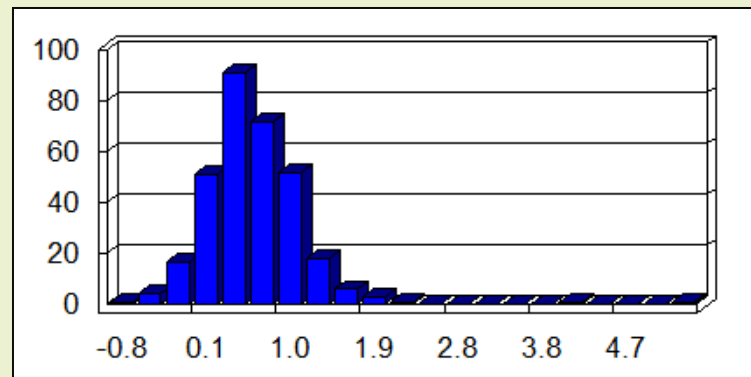
*Trig Station (Ellipsoidal)

SAAB DSM (Ellipsoidal)

318 Points

Minus

Difference

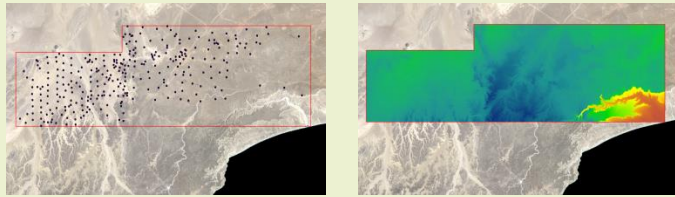


Trig Station With SAAB DSM in Ellipsoidal Height

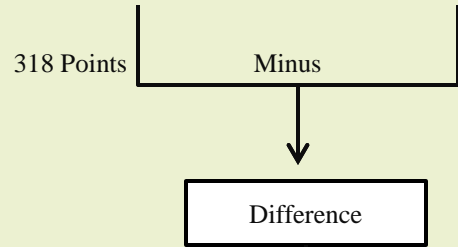
	SAAB DSM
Mean	0.007638 meter
Standard Deviation	0.673691 meter
RMSE	0.926008 meter

•Trig Stations= Survey Ground Control Points

Difference Between Trig Station in PHD93 With SAAB DSM in Ellipsoidal

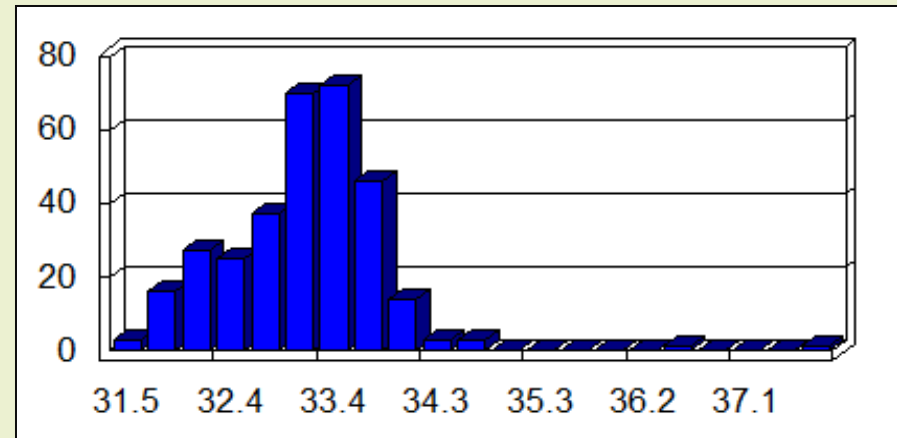


*Trig Station (Datum / PHD93) SAAB (Datum / Ellipsoidal)



Average →

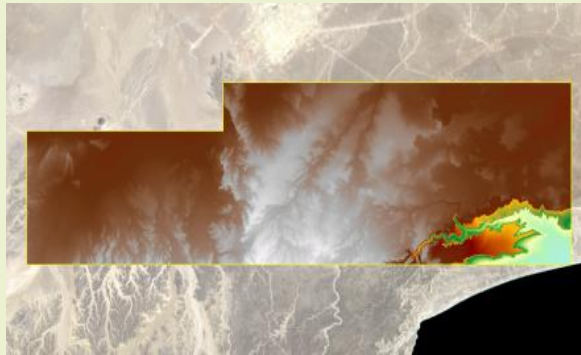
33.2 meter will be the offset which been used to convert SAAB DEM from Ellipsoidal to PHD93 by adding this value to all Pixels



SAAB DSM	
Mean	33.21996 meter
Standard Deviation	0.689164 meter

•Trig Stations= Survey Ground Control Points

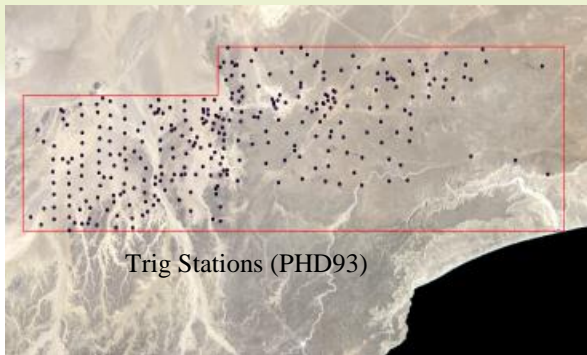
Difference Between Trig Station With SAAB DSM In PHD93 Height



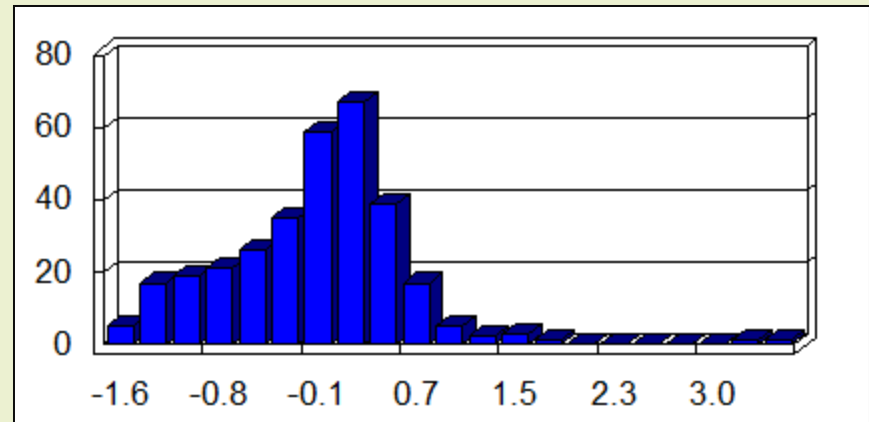
SAAB DSM 2M (PHD93)



Minus

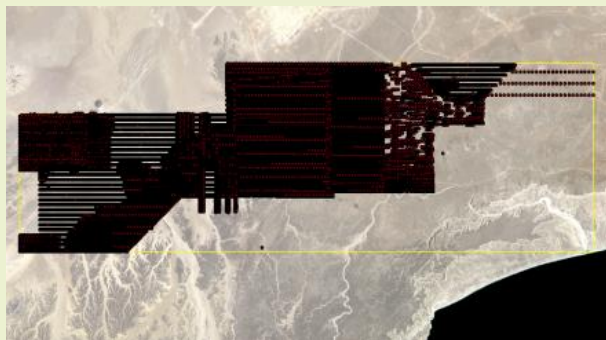


Trig Stations (PHD93)



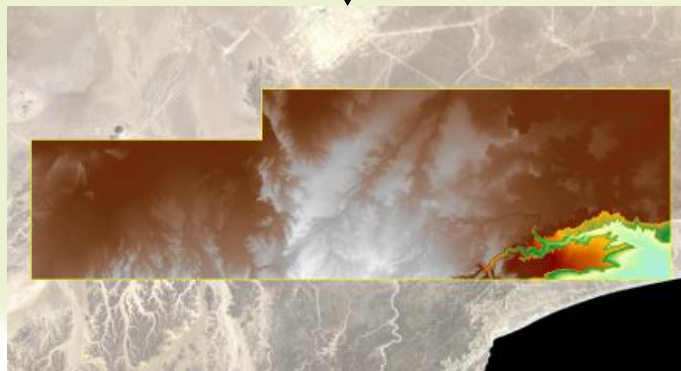
	SAAB DSM
Mean	0.007638 meter
Standard Deviation	0.673691 meter
RMSE	0.673734 meter

Difference Between TED Data With SAAB DSM in PHD93



*TED (PHD93) 480840 Points

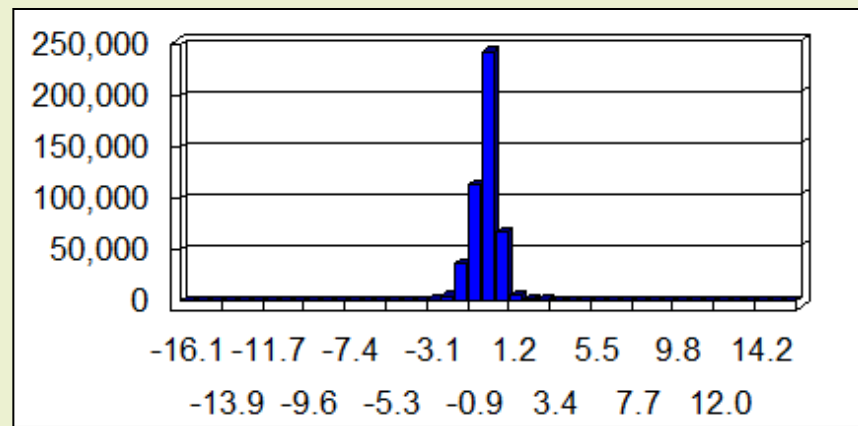
Minus



SAAB DSM 2M (PHD93)

Difference

	SAAB DSM
Mean	0.050469 meter
Standard Deviation	0.810225 meter
RMSE	0.811795 meter

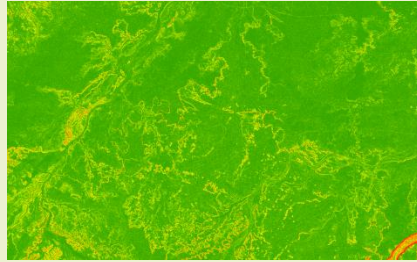


TED With SAAB DSM in PHD93

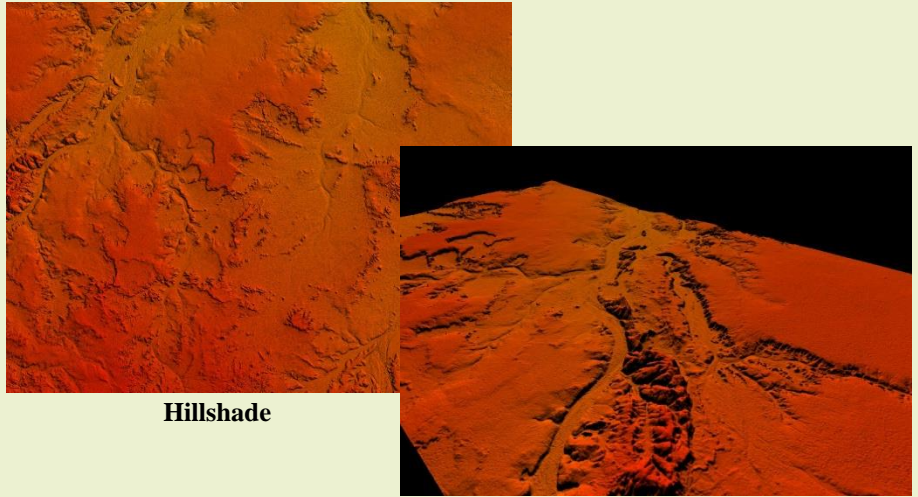
•TED= Terrain Elevation Database derived from seismic surveys

DEM Applications & Uses in PDO

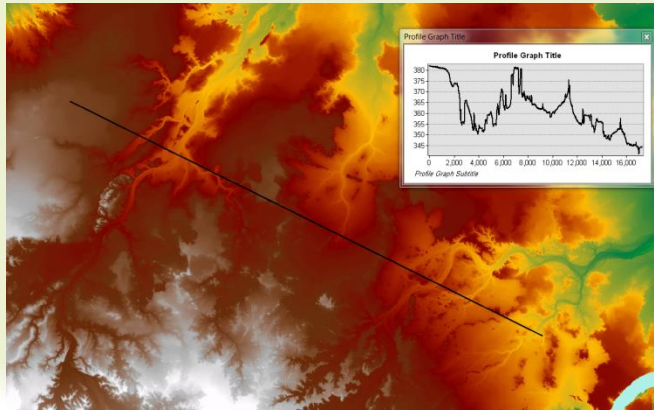
- 0 - 2.073425652
- 2.073425653 - 4.837993188
- 4.837993189 - 8.984844492
- 8.984844493 - 14.51397956
- 14.51397957 - 20.73425652
- 20.73425653 - 27.9912463
- 27.99124631 - 38.7039455
- 38.70394551 - 57.36477637
- 57.36477638 - 87.77501927



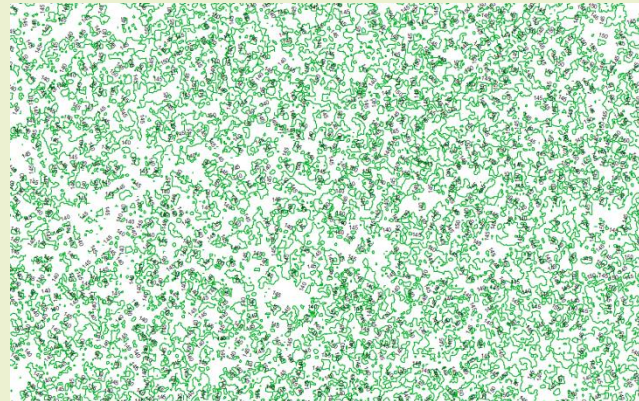
Slope Analysis



Hillshade



Elevation Profile



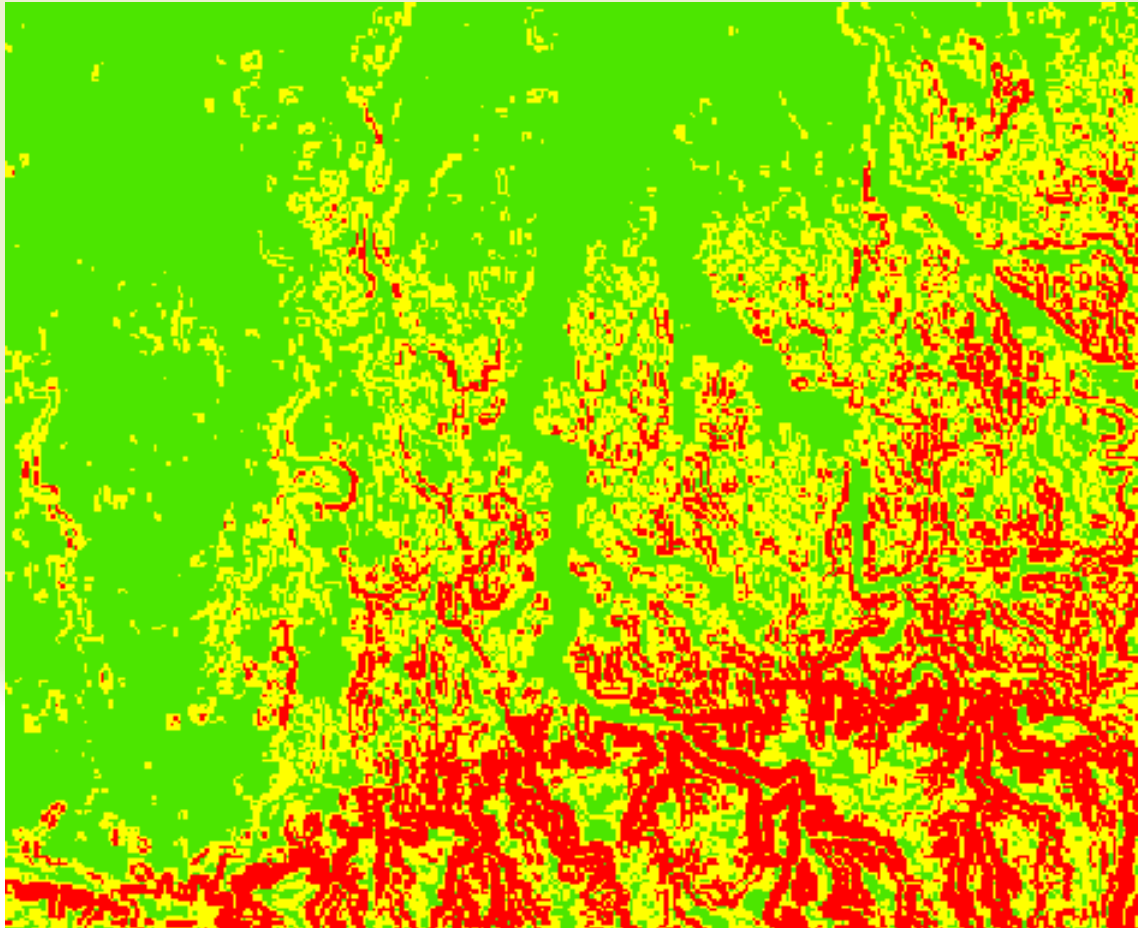
Contours




3D View

DEM Applications & Uses in PDO

- Proper Seismic Planning (i.e. Slope analysis)
- Exploration:
 - Locating geological features such as Anticline, Syncline & circular features (i.e. UPM)
 - Cliff Mapping
- Proper Planning of Pipeline & Road (Optimum route identification)
- Telecom planning (Microwave)
- Environmental applications (i.e. drainage)
- Bund wall for oil leakage containment (Block valve)

Seismic Acquisition Planning - Slope Analysis



-  0 - 15°
All accessible by vibroseis
-  15° - 35°
Line crew to be trained & lead by mountaineers
-  35°
Mountaineers

Conclusion

It is proven that SAAB DSM offers an alternative solution that provides, **high resolution**, **cheaper** and **timely** DSM to support various business activities in Oil and Gas sector such as seismic surveys planning.

Thank You For Your Attention



Discussion



شركة تنمية نفط عُمان
Petroleum Development Oman

Geospatial Forum 2015

