The Suitability of the TanDEM-X 90 DEM for flood models

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All work presented currently under review in Remote Sensing of Environment

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Topography a major influence on the quality of flood predictions

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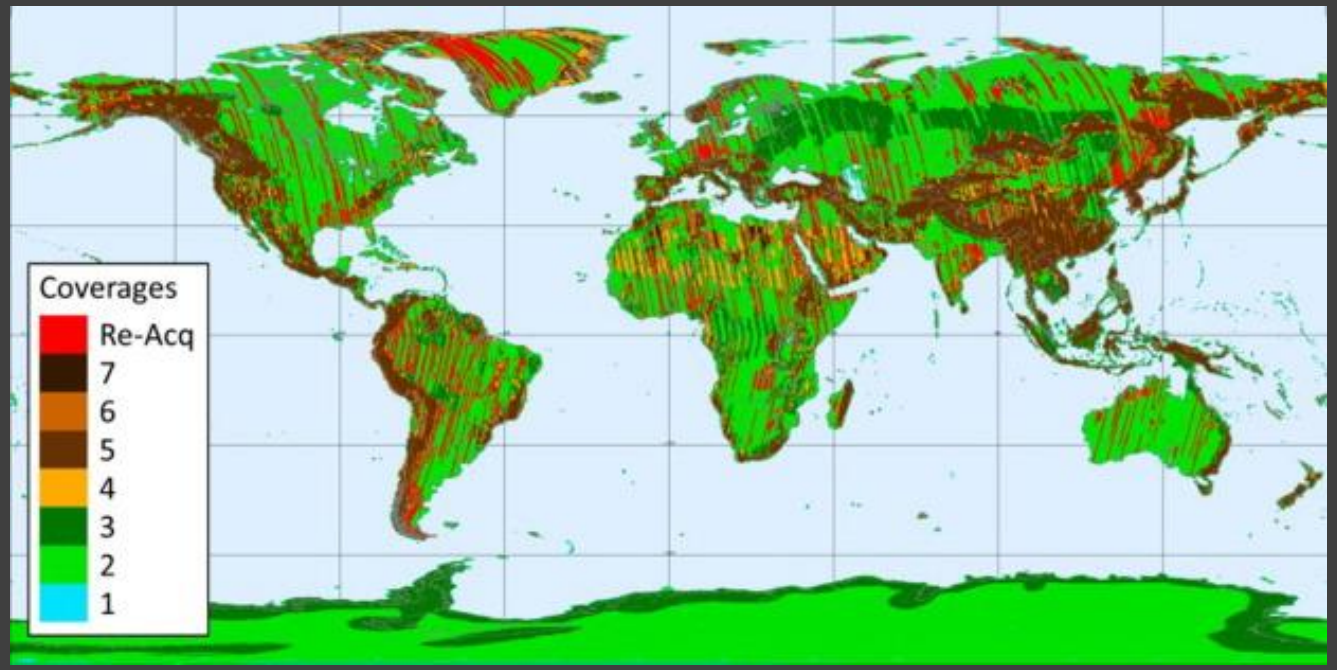
TanDEM-X 90

German Aerospace Center (DLR) & Airbus

90m Resolution

Complete **Global Coverage**



TanDEM-X 90 Coverage Map from Rizzoli et al (2017)

Rizzoli, P., Martone, M., Gonzalez, C., Wecklich, C., Tridon, D.B., Bräutigam, B., Bachmann, M., Schulze, D., Fritz, T., Huber, M. and Wessel, B., 2017. Generation and performance assessment of the global TanDEM-X digital elevation model. *ISPRS Journal of Photogrammetry and Remote Sensing*, *132*, pp.119-139.

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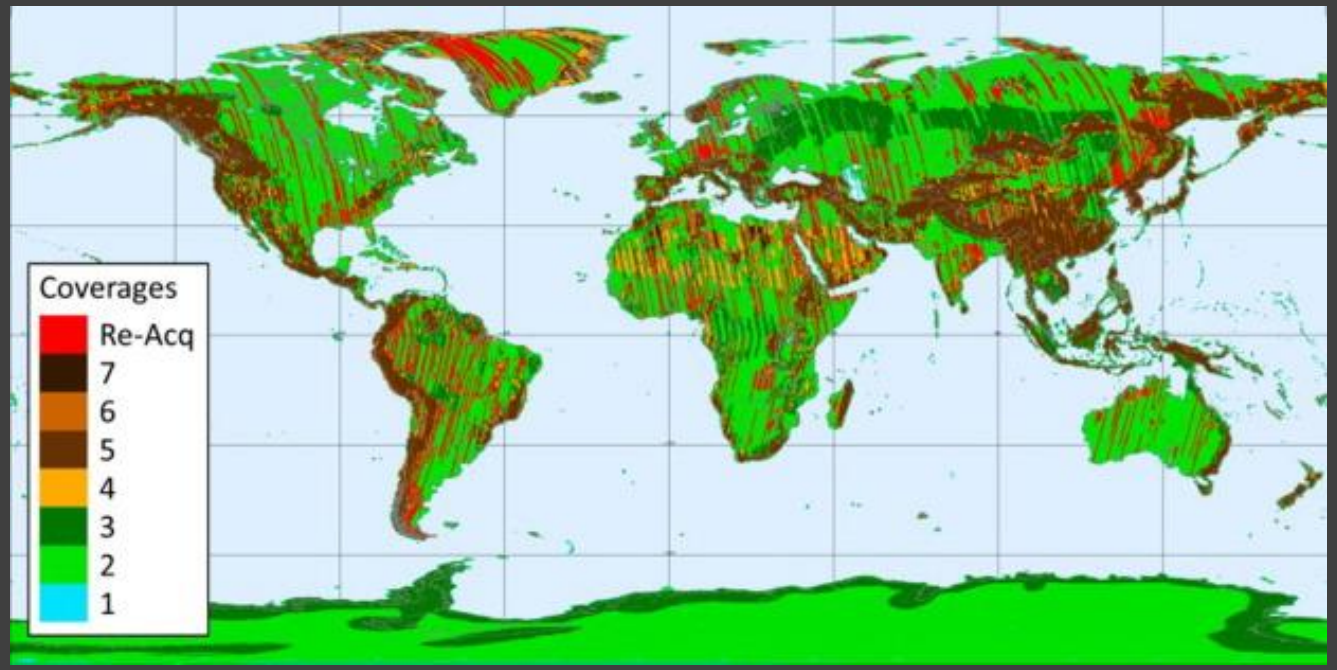
TanDEM-X 90

- **Free** to Download
- Images acquired 2011-2015
- 7 Auxiliary Files incl. Water Indication Mask, Coverage and Height Error Map



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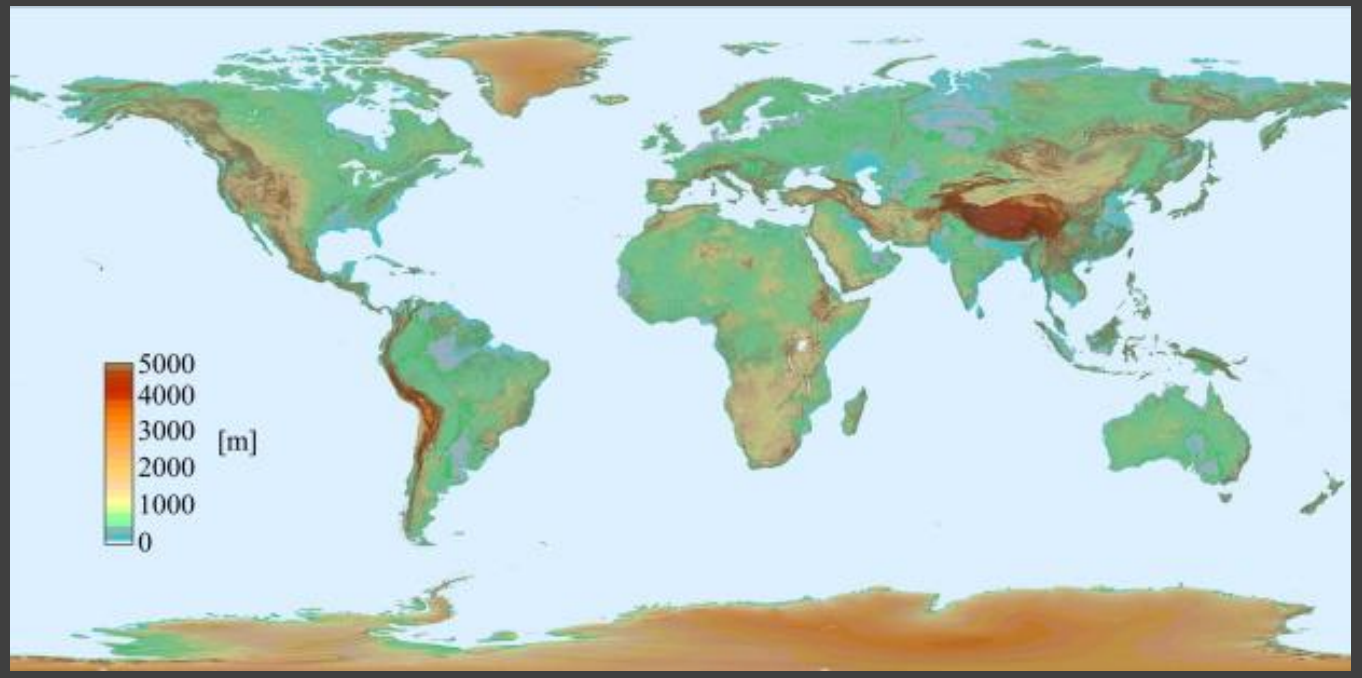
Points to Consider

Predominately a **Digital Surface Model**

Current Release **non-edited** version



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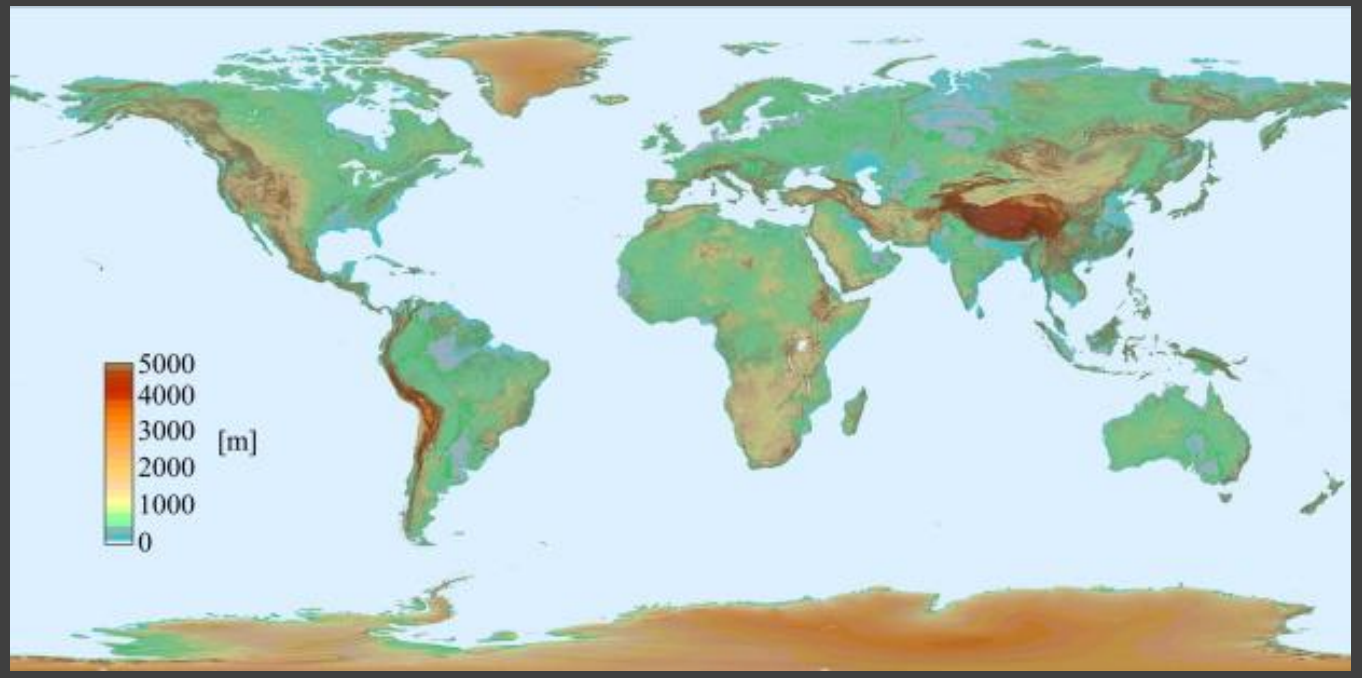
Points to Consider

WGS84 **Ellipsoid**

RMSE 1.1m – 1.8m*



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*Wessel, B., Huber, M., Wohlfart, C., Marschalk, U., Kosmann, D. and Roth, A., 2018. Accuracy assessment of the global TanDEM-X Digital Elevation Model with GPS data. *ISPRS Journal of Photogrammetry and Remote Sensing*, *139*, pp.171-182.

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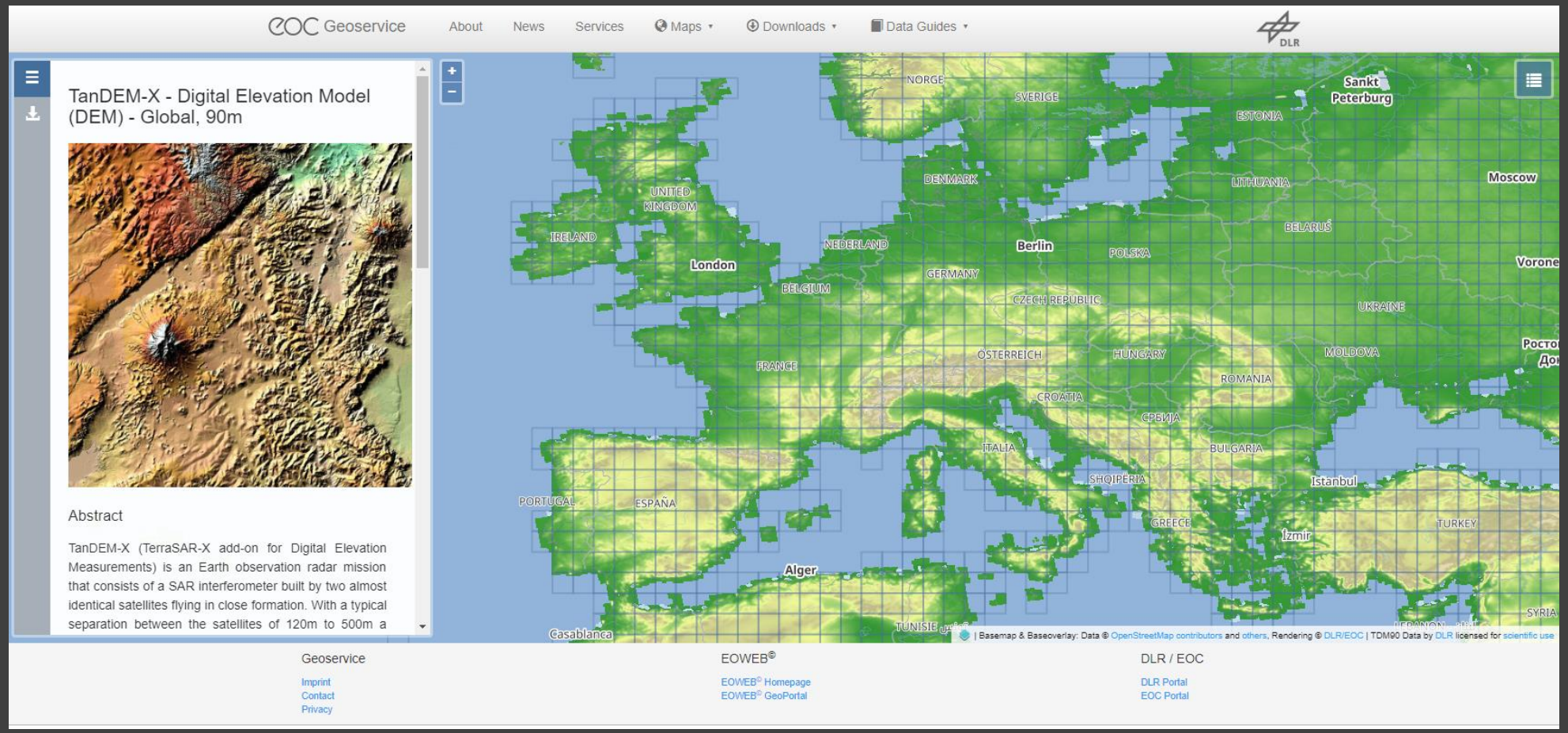

https://download.geoservice.dlr.de/TDM90/

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Objectives

What is the **vertical error** of TanDEM-X 90 DEM over low slope **floodplains**, and how does this **compare to other free global DEMs**?

How does the vertical error of TanDEM-X 90 DEM differ between floodplain **landcover** types?

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Study Sites

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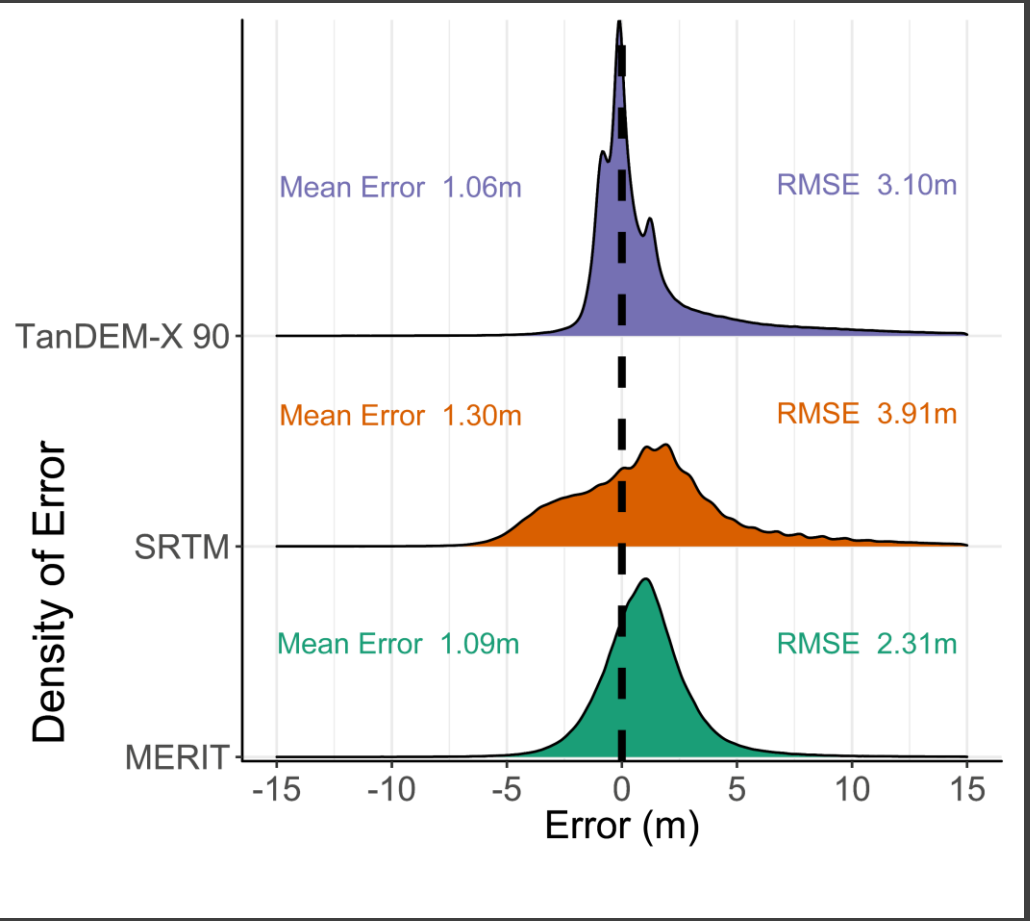
Which is most accurate?



RMSE = MERIT

Mean Error = TanDEM-X

SRTM least accurate

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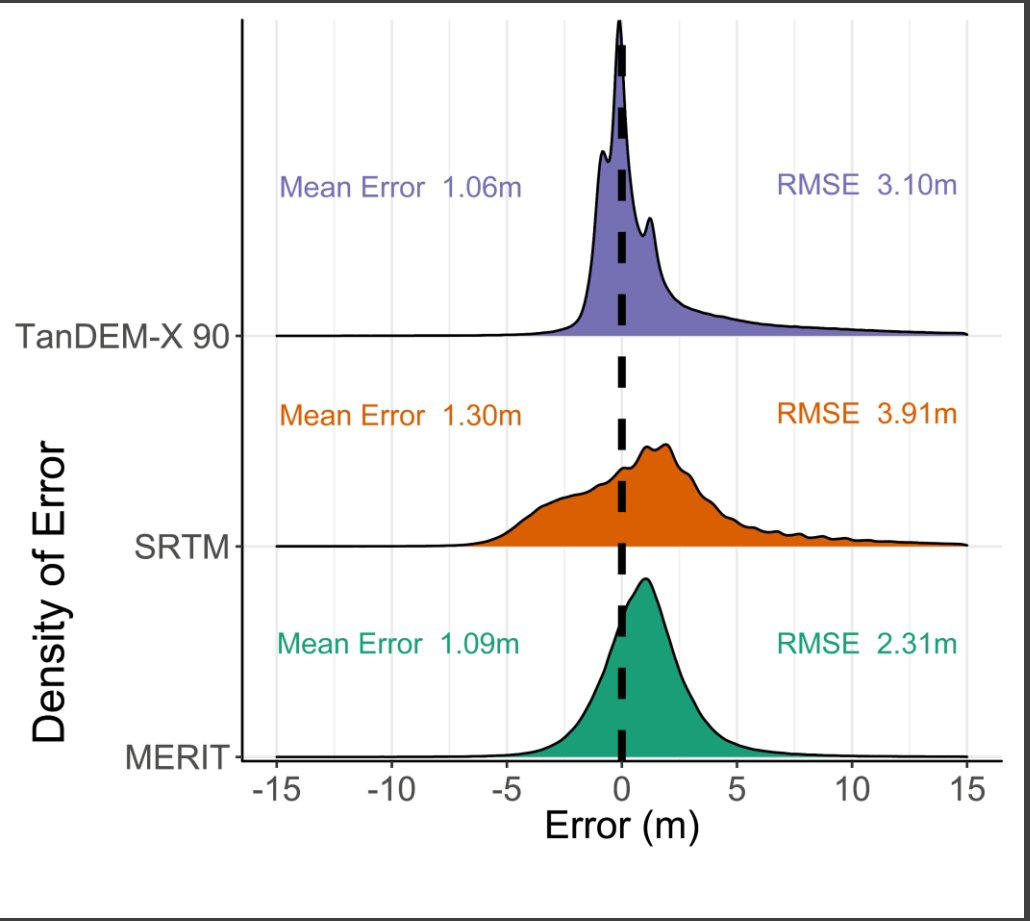
Which is most accurate?



TanDEM-X error much **narrower** distribution

TanDEM-X accuracy statistics **distorted** by large errors

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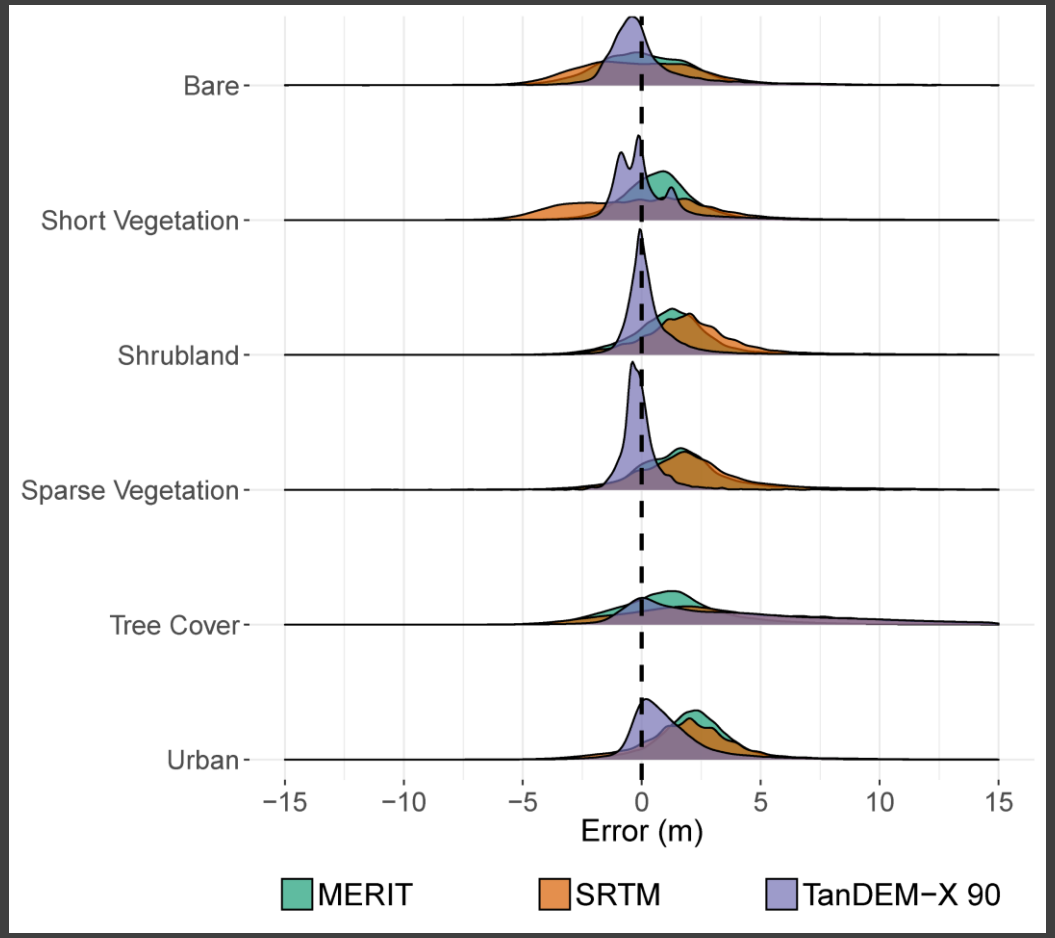
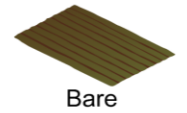
Does Landcover affect accuracy?



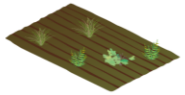
Category	DEM	ME (m)	MAE (m)	RMSE (m)
Bare	MERIT	0.36	1.65	2.22
	SRTM	0.33	2.26	2.99
	TanDEM-X 90	0.03	1.17	2.04
Short Vegetation	MERIT	0.71	1.35	1.83
	SRTM	-0.02	2.42	3.07
	TanDEM-X 90	0.36	1.22	2.12
Shrubland	MERIT	1.24	1.77	2.34
	SRTM	2.12	2.51	3.34
	TanDEM-X 90	0.48	0.95	1.95
Sparse Vegetation	MERIT	1.79	2.25	3.09
	SRTM	2.15	2.61	3.54
	TanDEM-X 90	-0.01	0.68	1.30
Tree Cover	MERIT	1.61	2.26	3.12
	SRTM	4.17	4.78	6.04
	TanDEM-X 90	3.69	4.07	5.68
Urban	MERIT	2.29	2.39	2.79
	SRTM	2.11	2.48	3.14
	TanDEM-X 90	1.19	1.50	2.38

Most Accurate Global DEM by Landcover Category


Bare — TanDEM-X 90


Short Vegetation — MERIT


Shrubland — TanDEM-X 90


Sparse Vegetation — TanDEM-X 90


Tree Cover — MERIT


Urban — TanDEM-X 90

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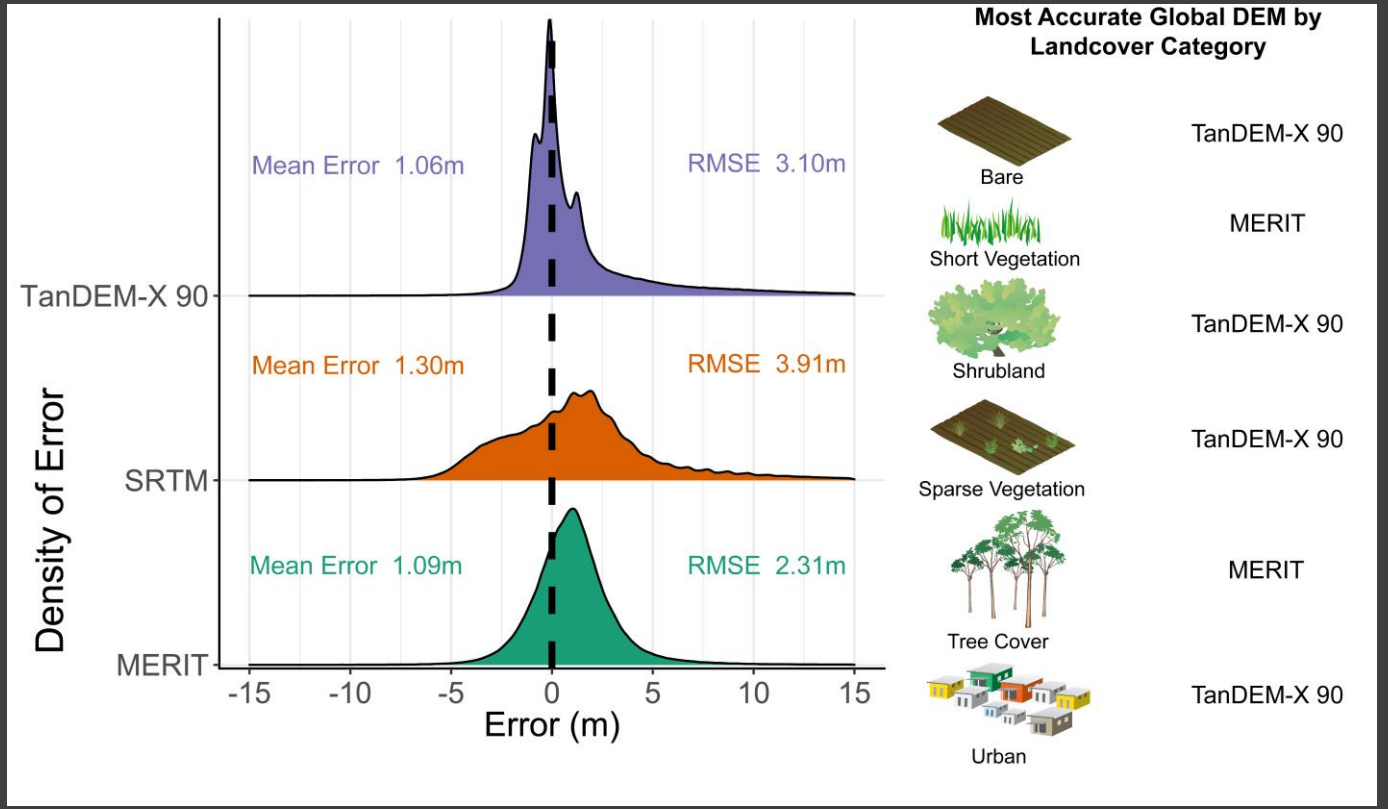
So is TanDEM-X 90 suitable?

Similar accuracy to MERIT

Accuracy statistics impacted by small number of large errors



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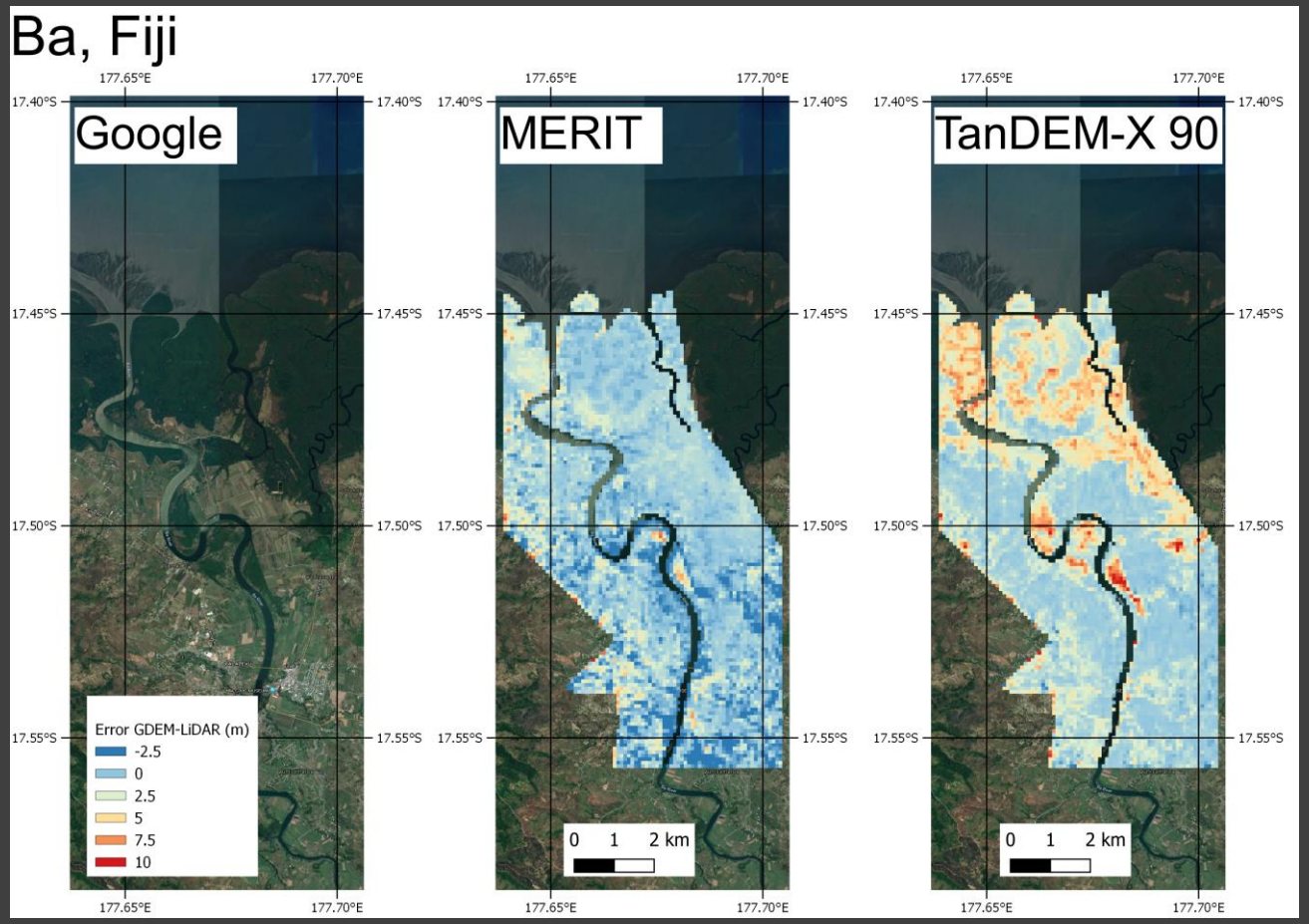
So is TanDEM-X 90 suitable?

Most accurate in **bare, shrubland, sparse vegetation and urban areas**

Worse accuracy in **tree-covered areas**



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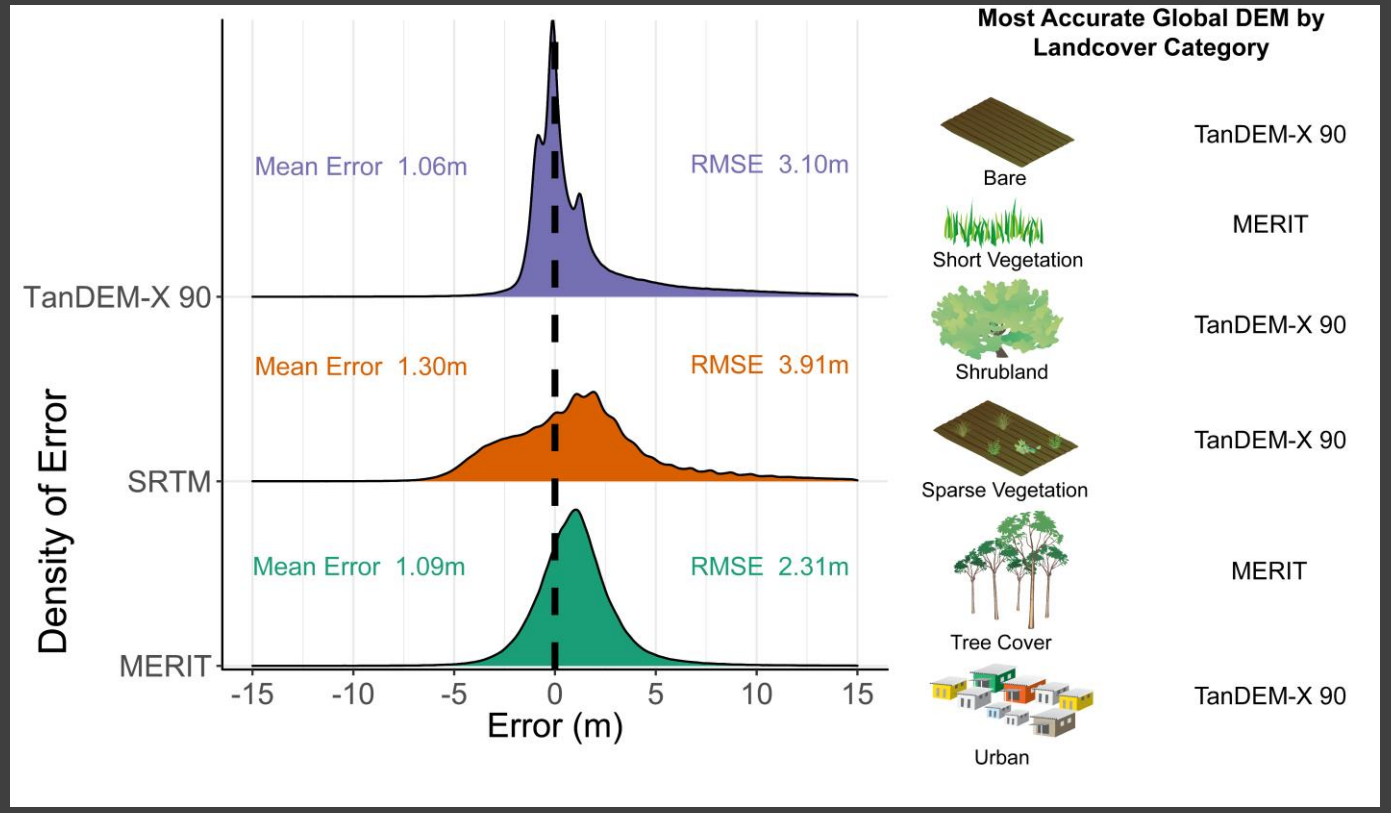
The future of TanDEM-X 90

Vegetation Removal!

Outlier and artefact removal

Advocate using multiple DEMs – both MERIT and TanDEM-X 90



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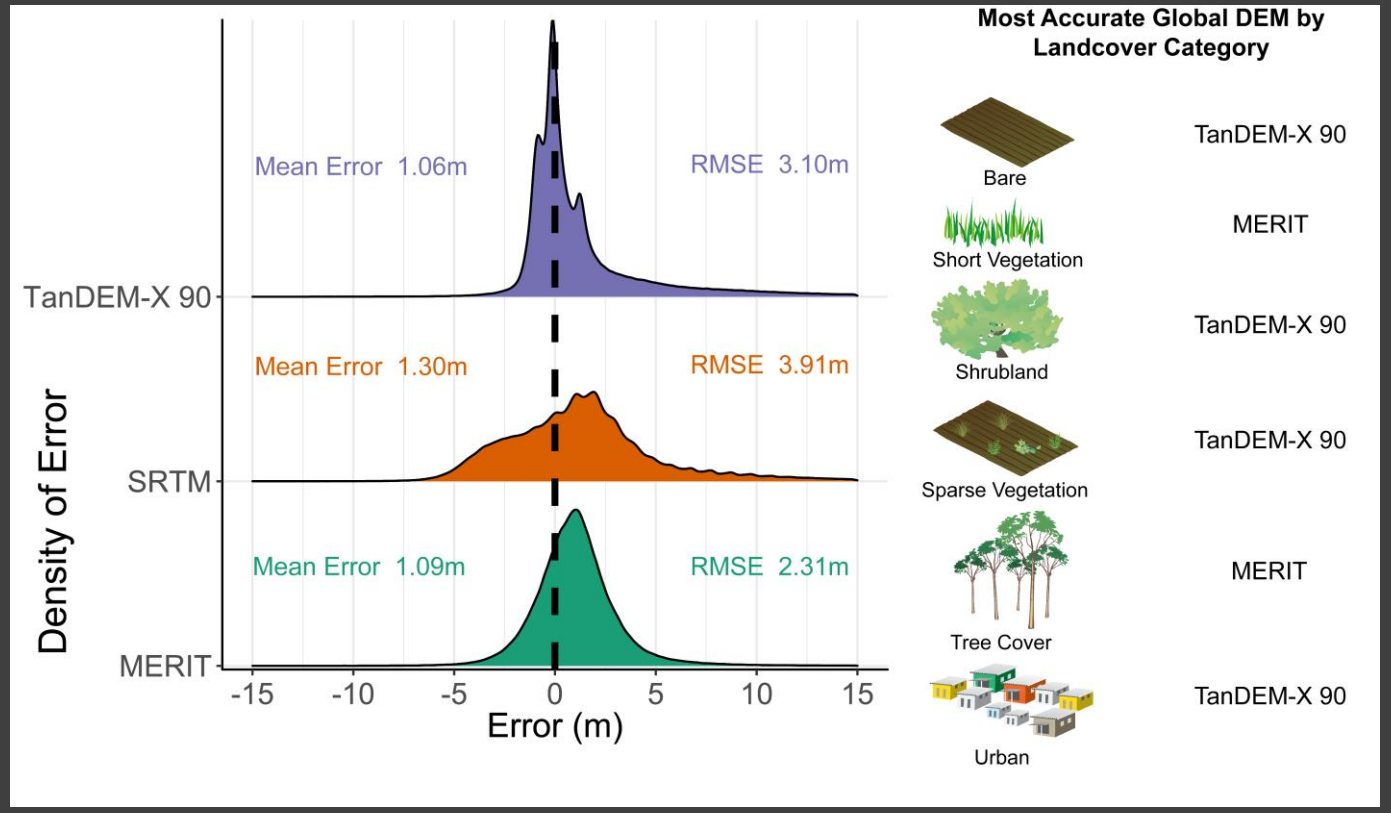

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