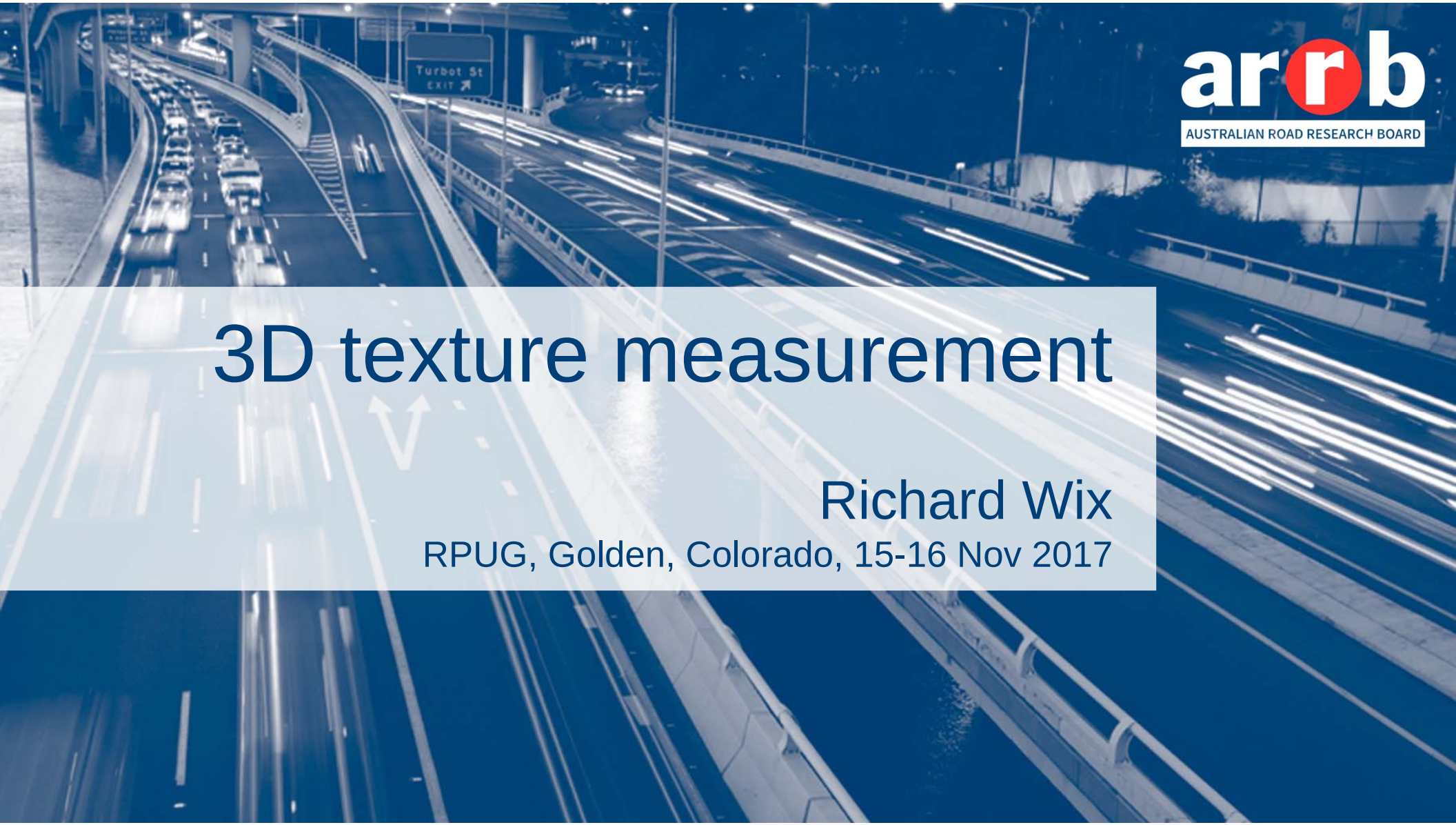


3D texture measurement

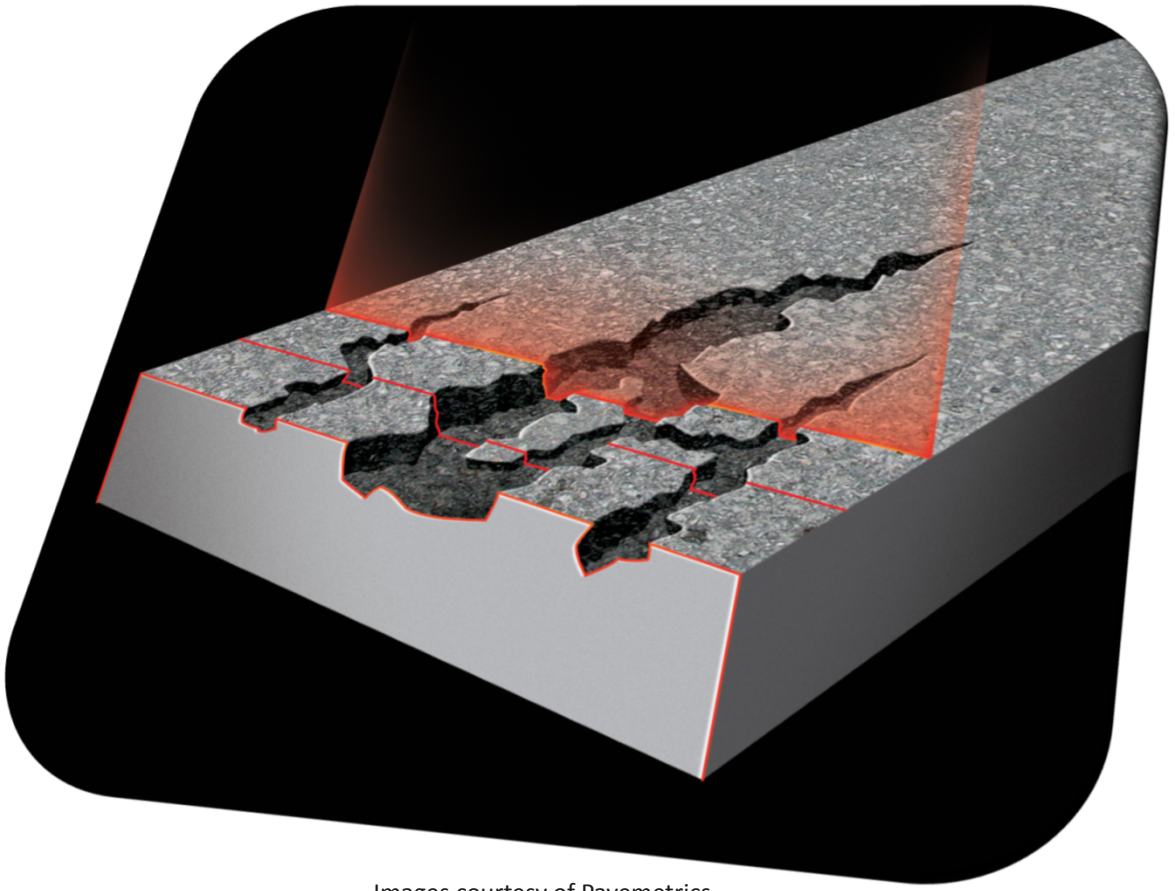
Richard Wix

RPUG, Golden, Colorado, 15-16 Nov 2017

Overview

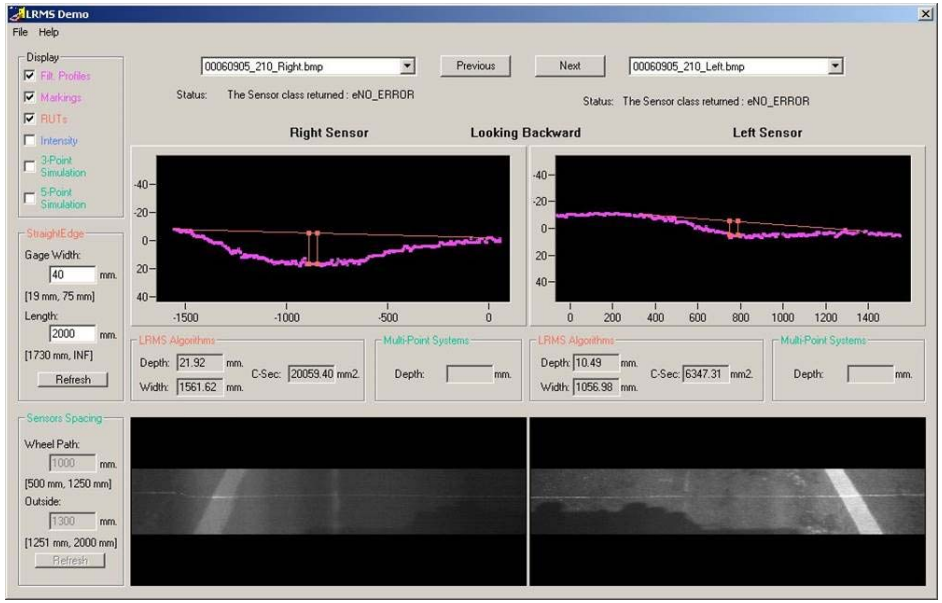
- 3D technology
- Texture measurement
- Validation
- Observations
- Conclusions & future work

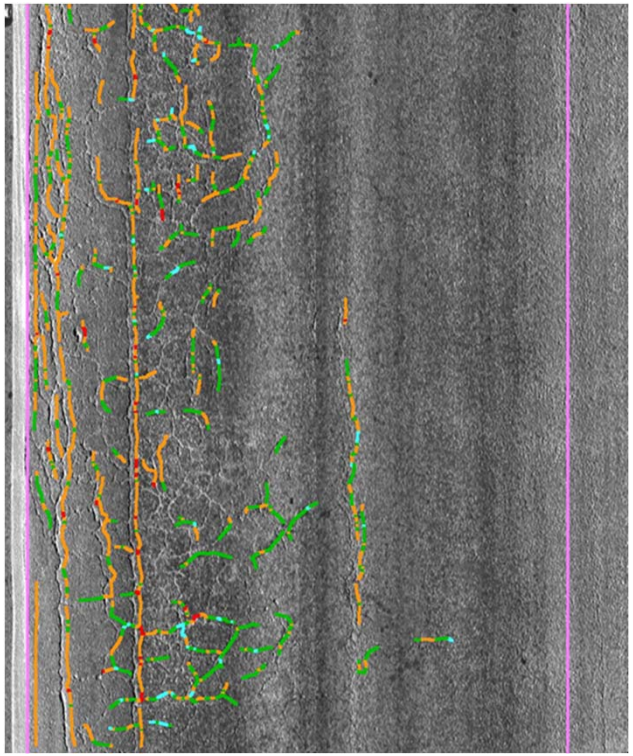
LCMS - system configuration



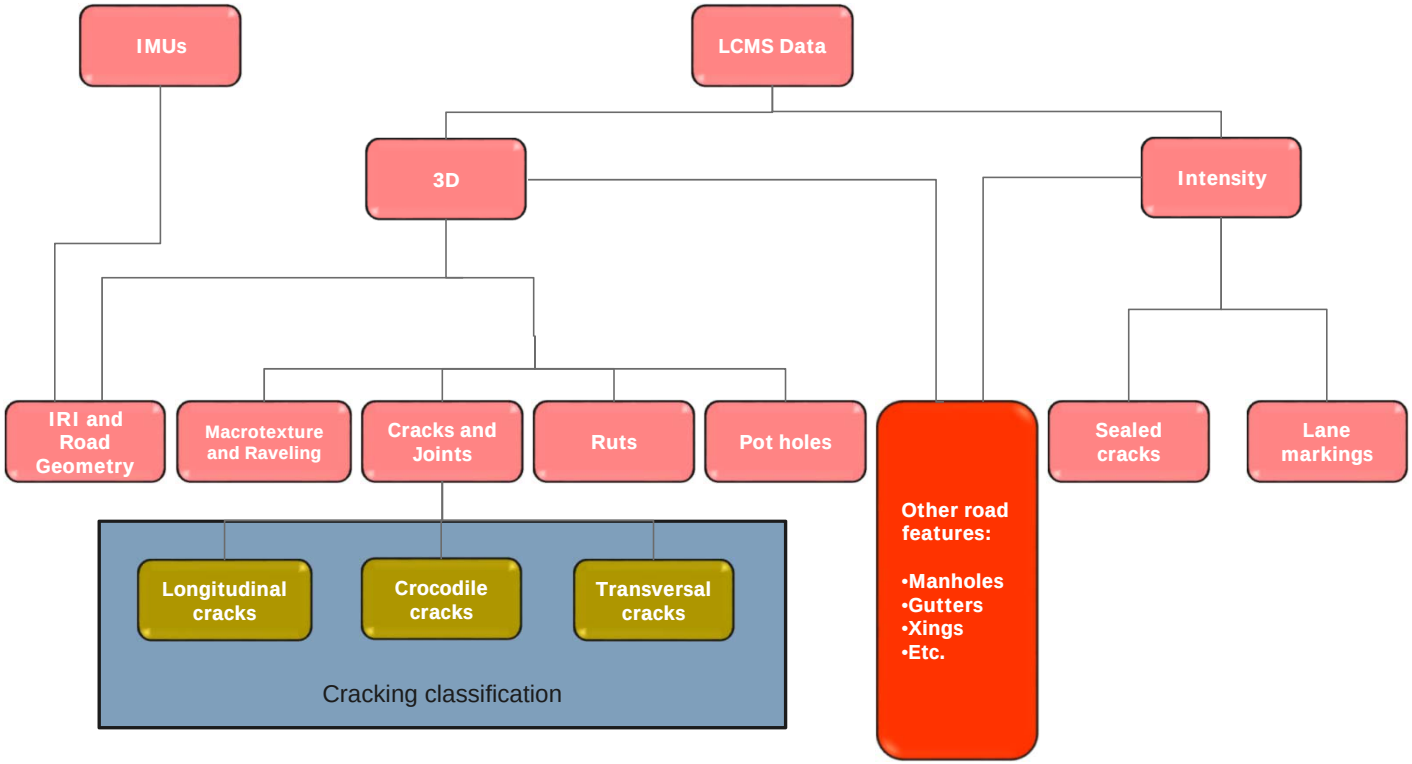
Images courtesy of Pavemetrics

Typical uses of 3D technology



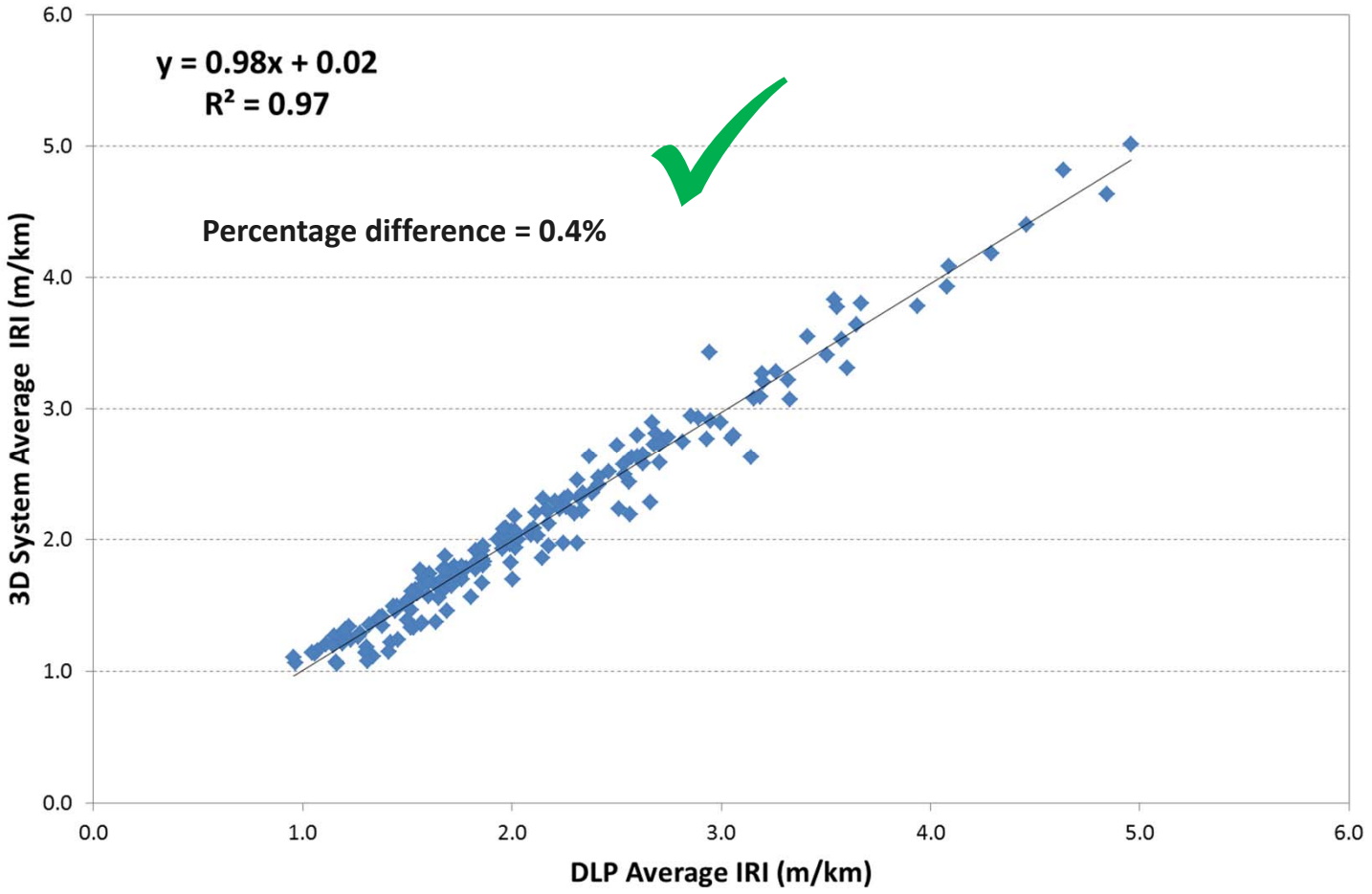


3D technology can do more



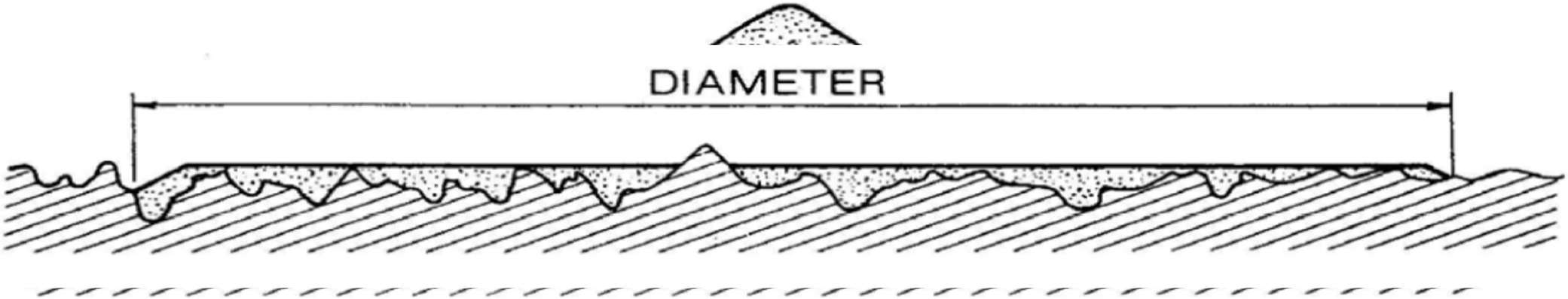
Flow chart courtesy of Pavemetrics

Other uses - IRI



Other uses – pavement macro-texture

Manual sand patch test method

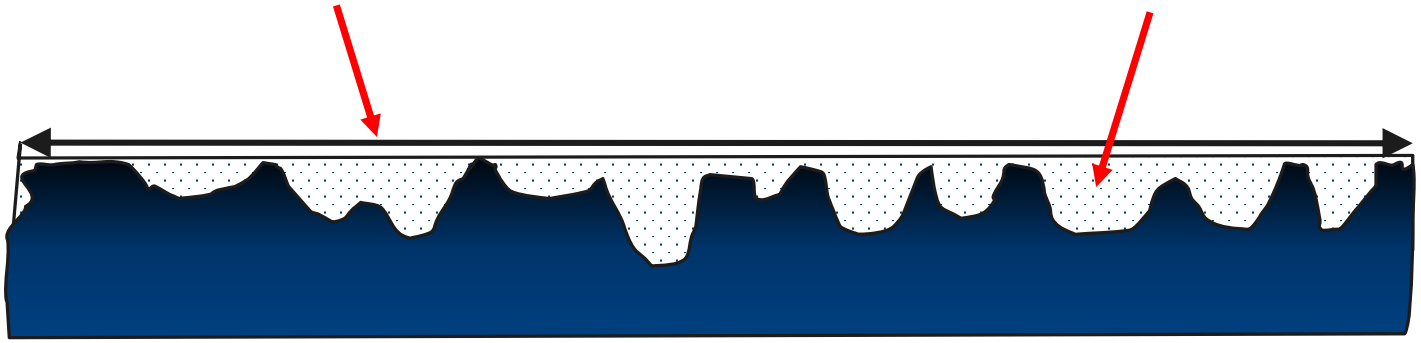


$$MTD = \frac{4V}{\pi D^2} \; x \; 10^3$$

LCMS sand patch method

Surface area (Diameter)

Air-void volume (Sand volume)



$$MTD = \frac{Volume_{air\ void}}{Surface\ Area}$$

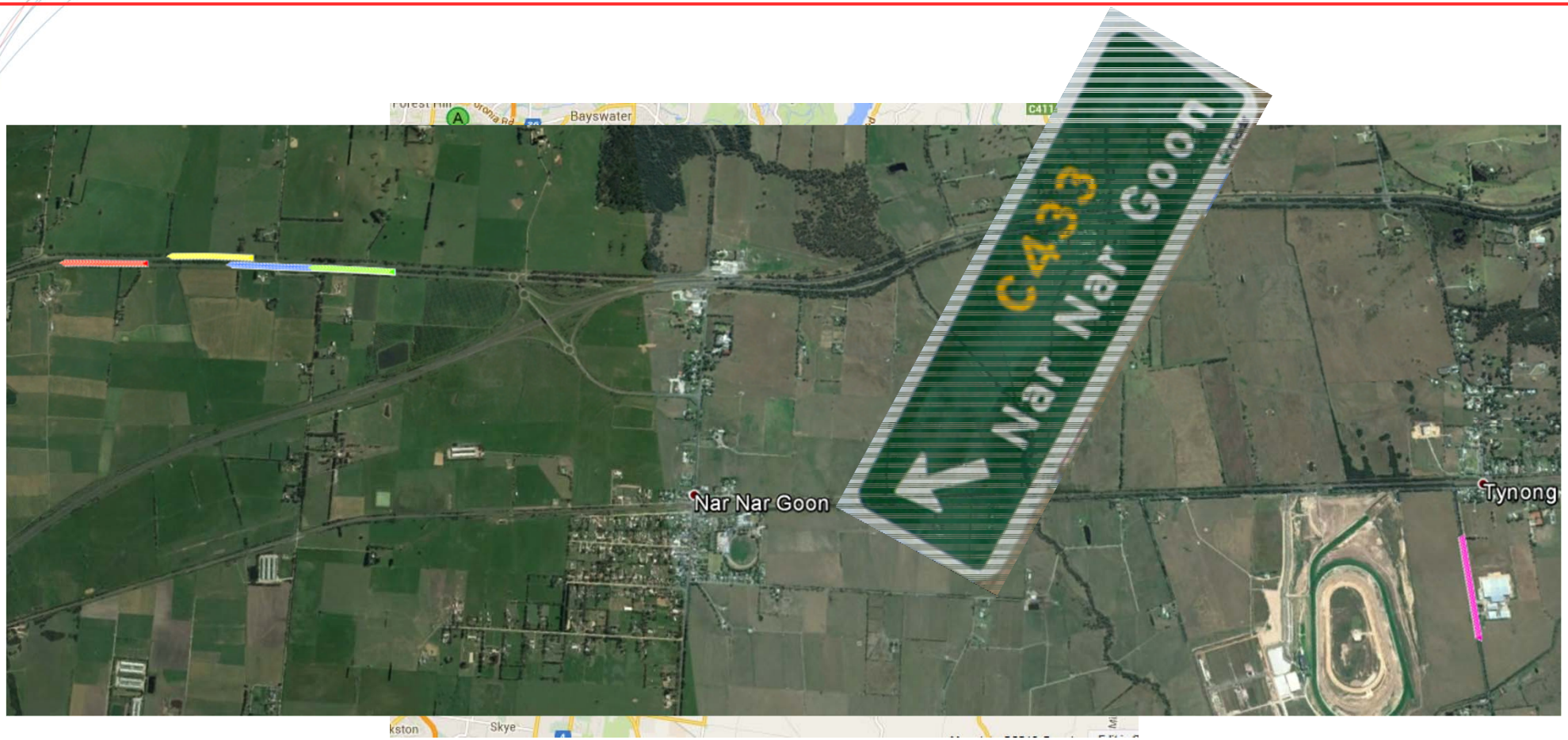
Comparison

Known volume

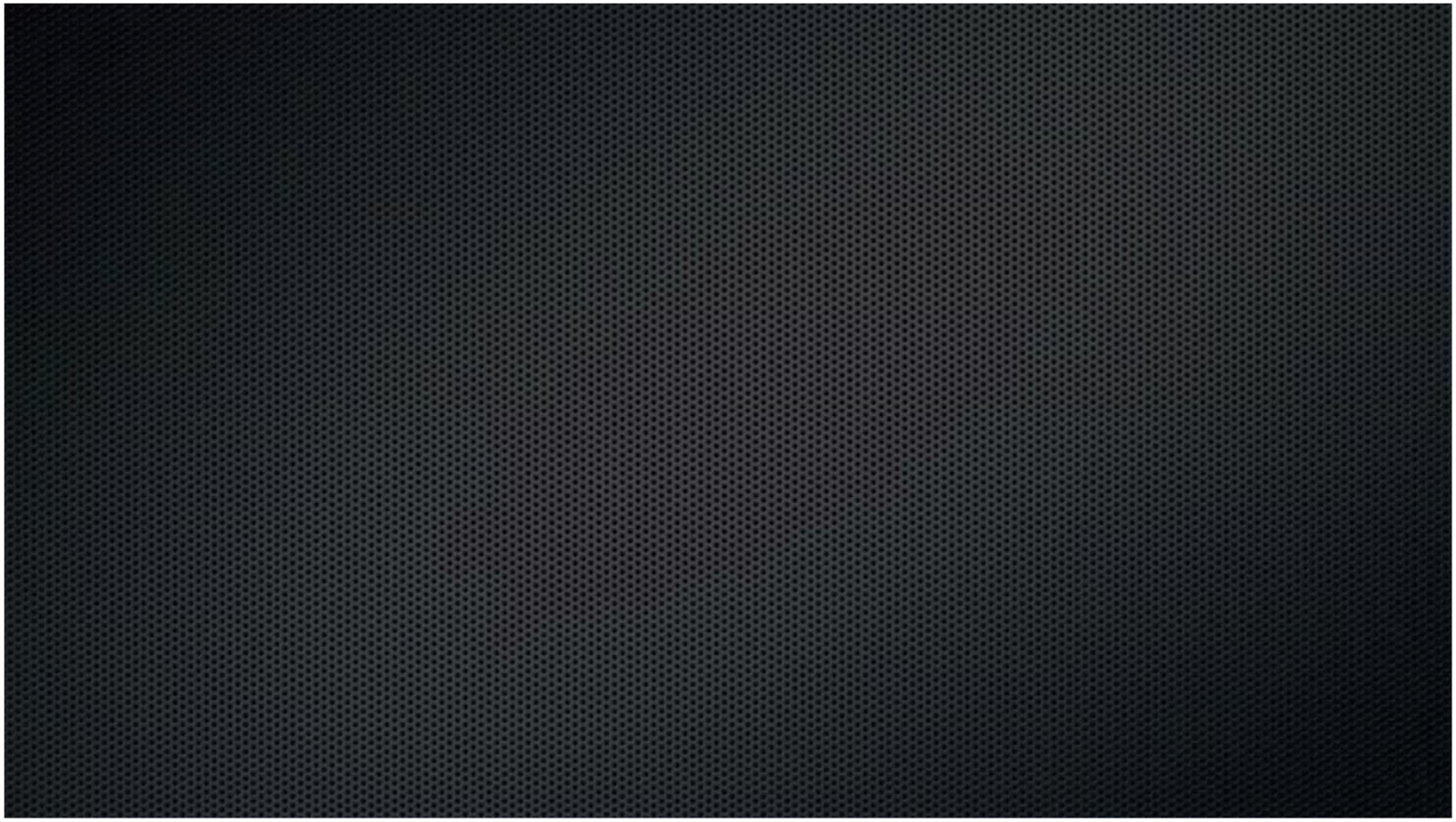
Known area (250mm x 250mm)

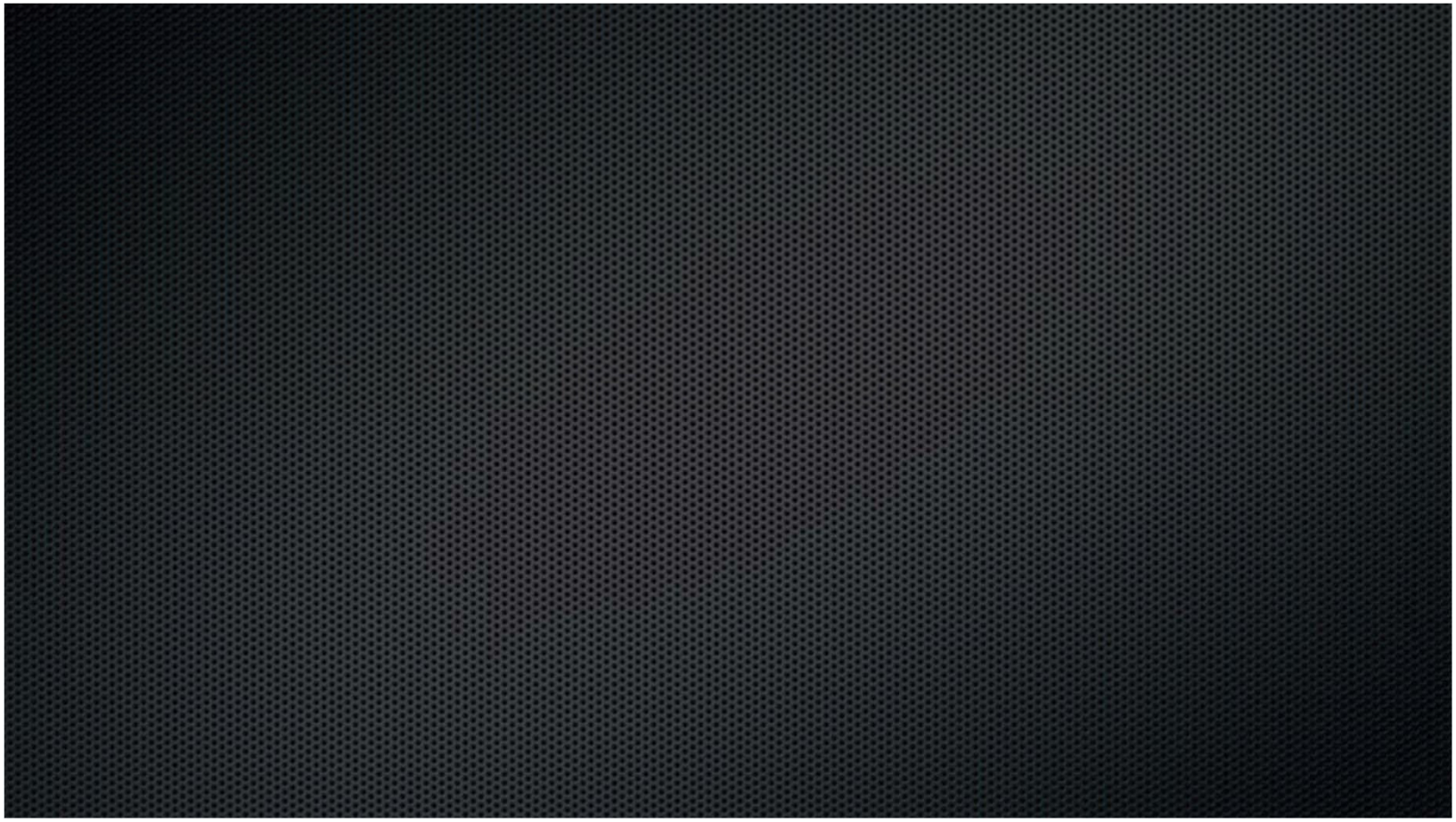
3D texture versus ground truth

Validation sites

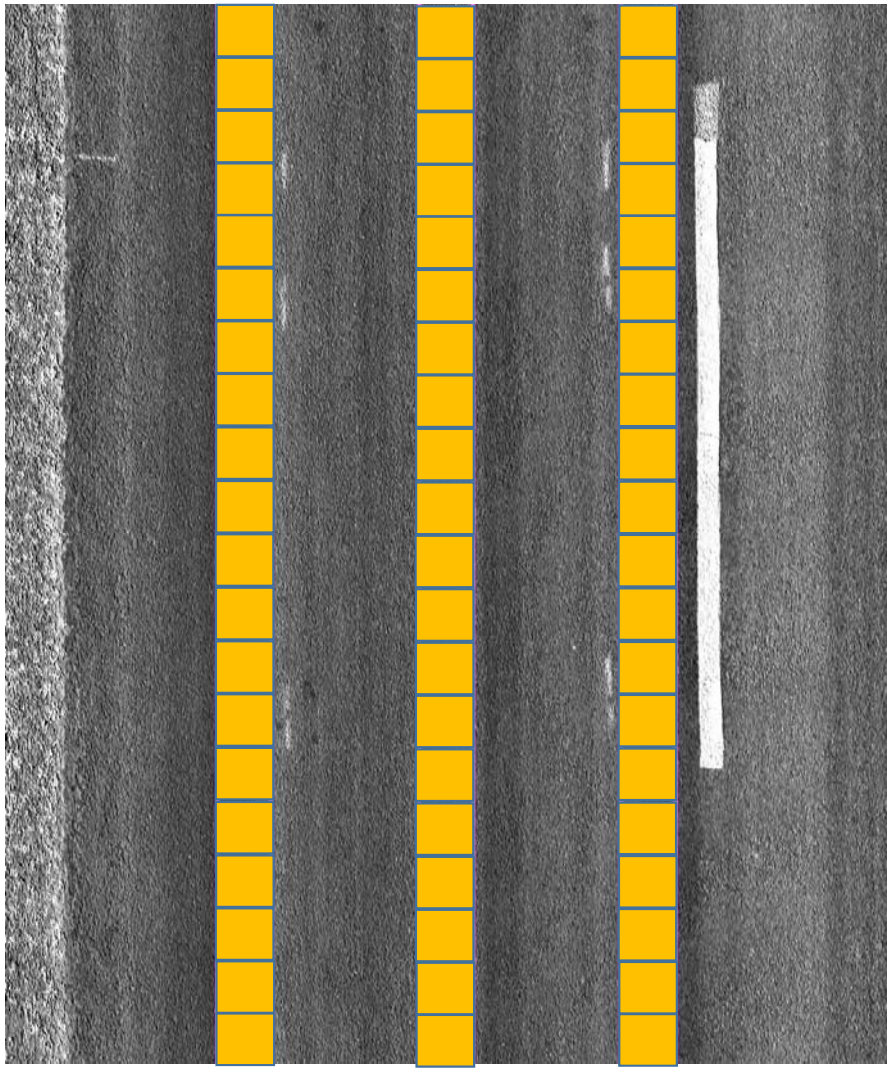


Historically…..

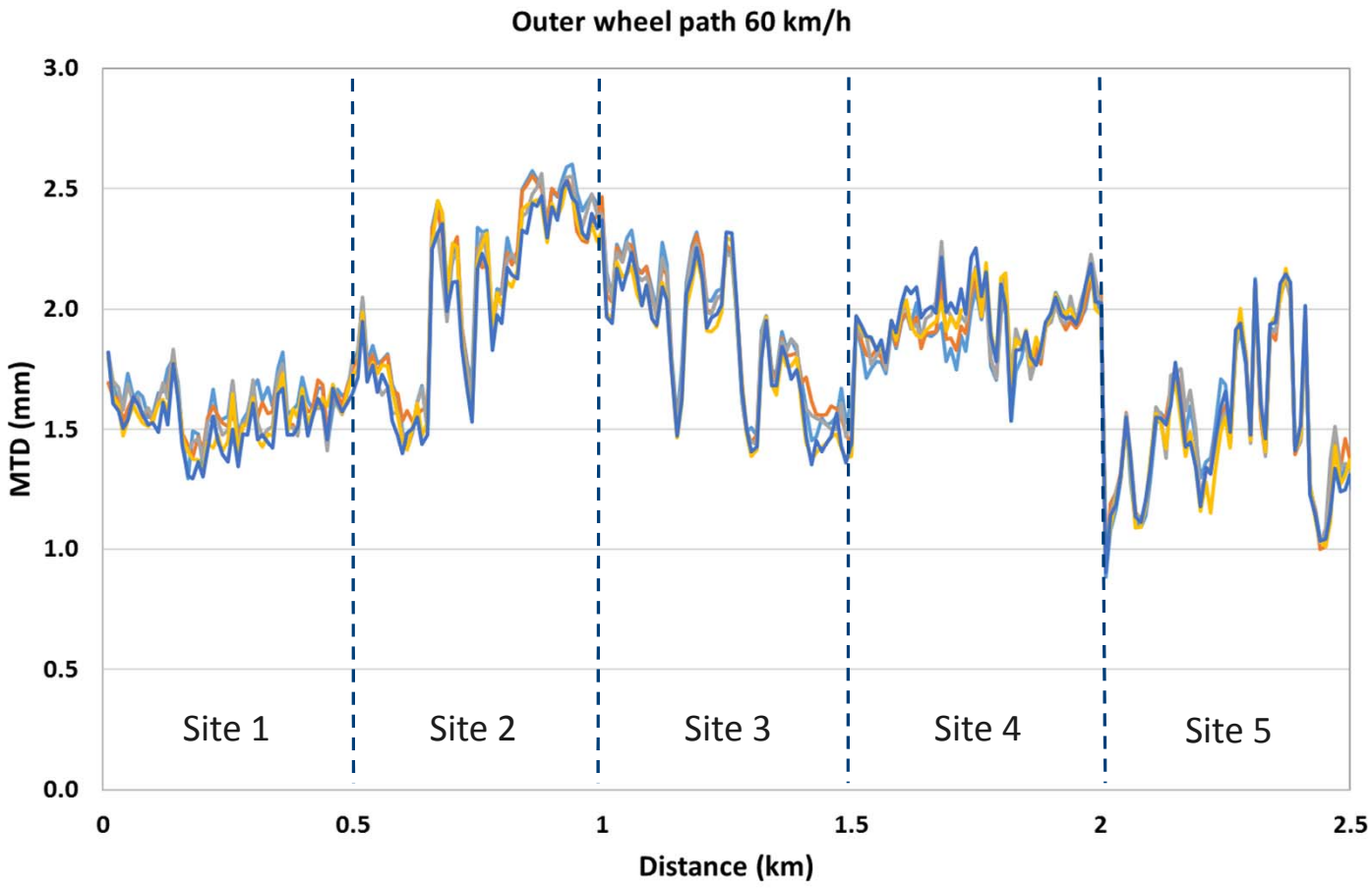




Validation trial

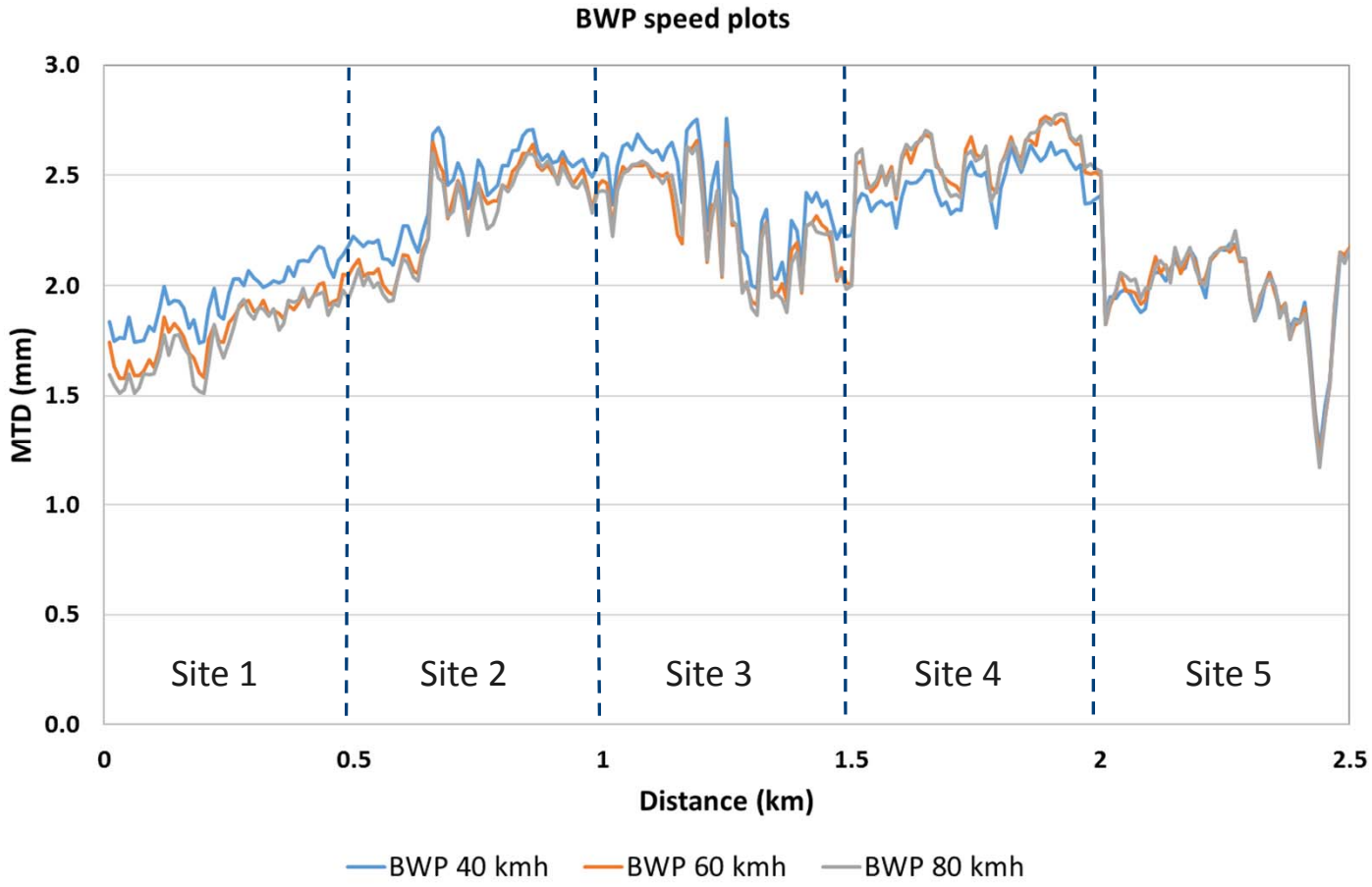


Internal repeatability

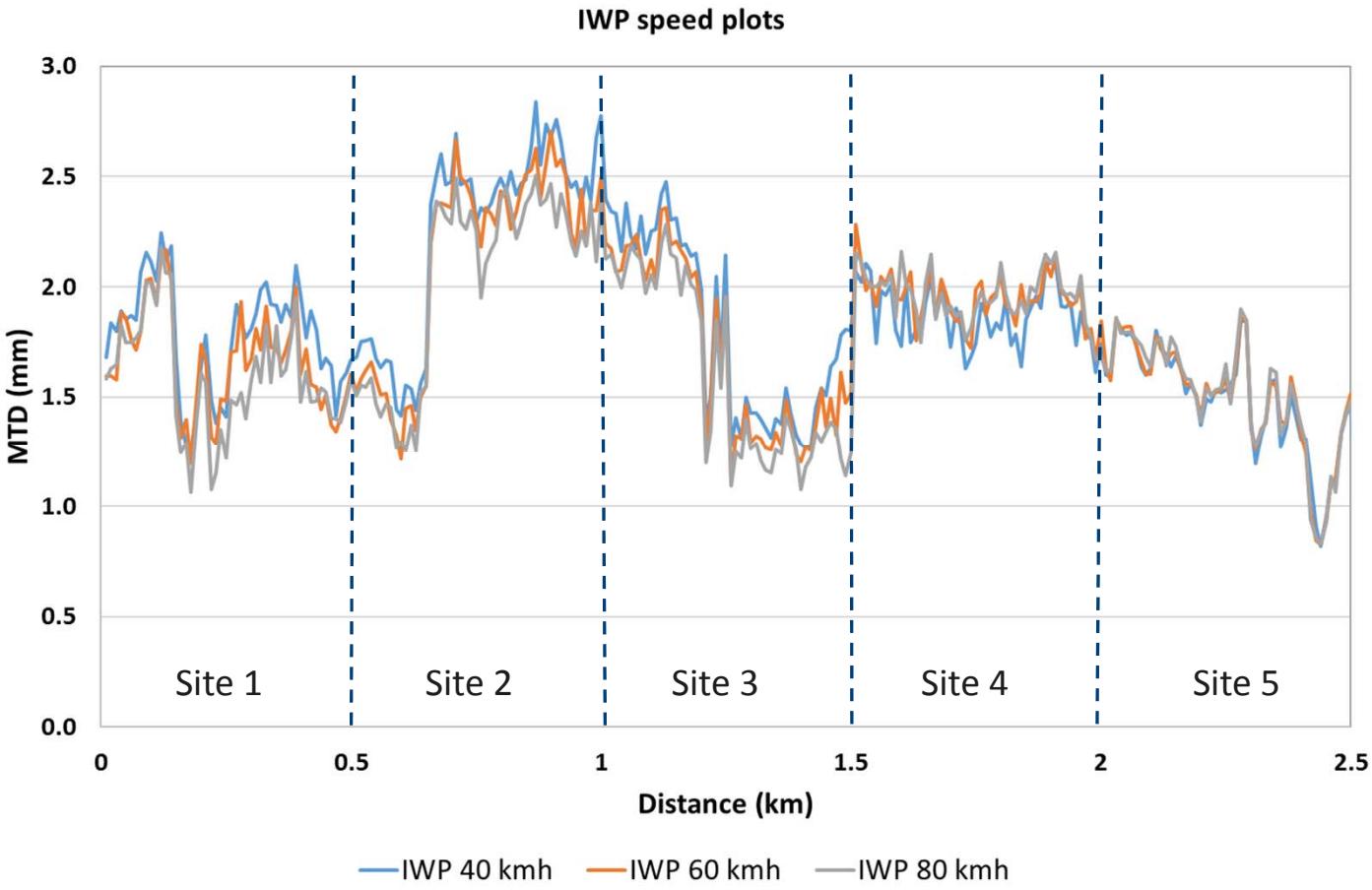


Internal repeatability

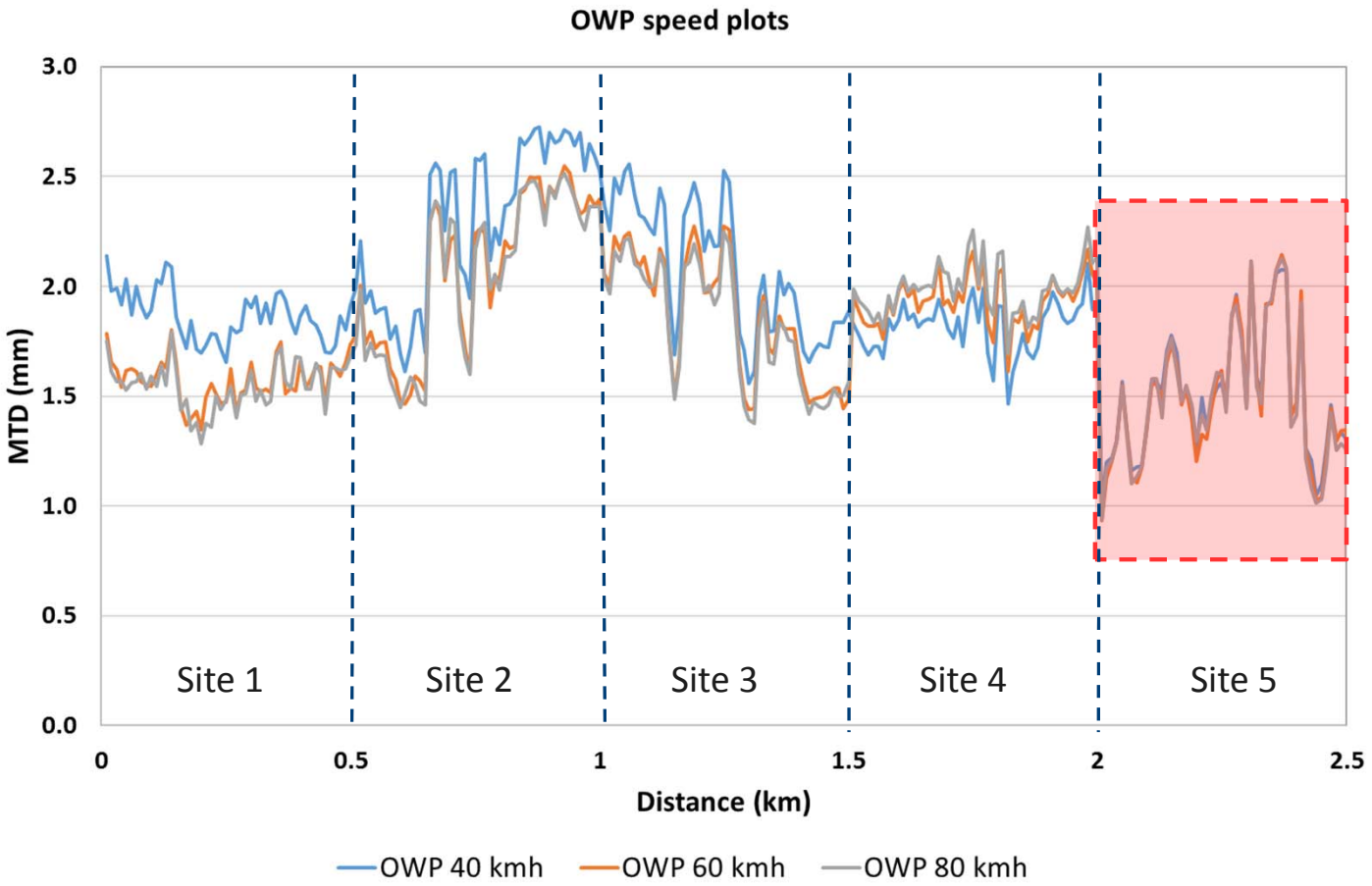
Is there a speed dependency?



Is there a speed dependency?



Is there a speed dependency?

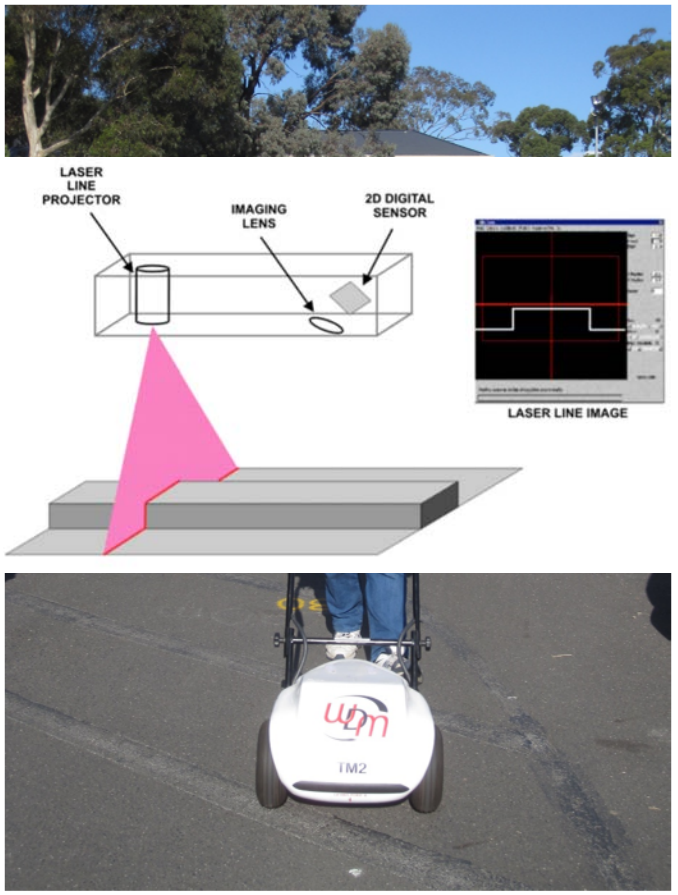


Some statistics – speed comparison

MTD	60 v 40 kmh			60 v 80 kmh		
	IWP	BWP	OWP	IWP	BWP	OWP
r-squared	0.91	0.90	0.81	0.95	0.99	0.98
slope	1.00	0.85	0.99	0.96	1.03	1.00
intercept	0.04	0.39	0.13	0.02	-0.08	-0.01

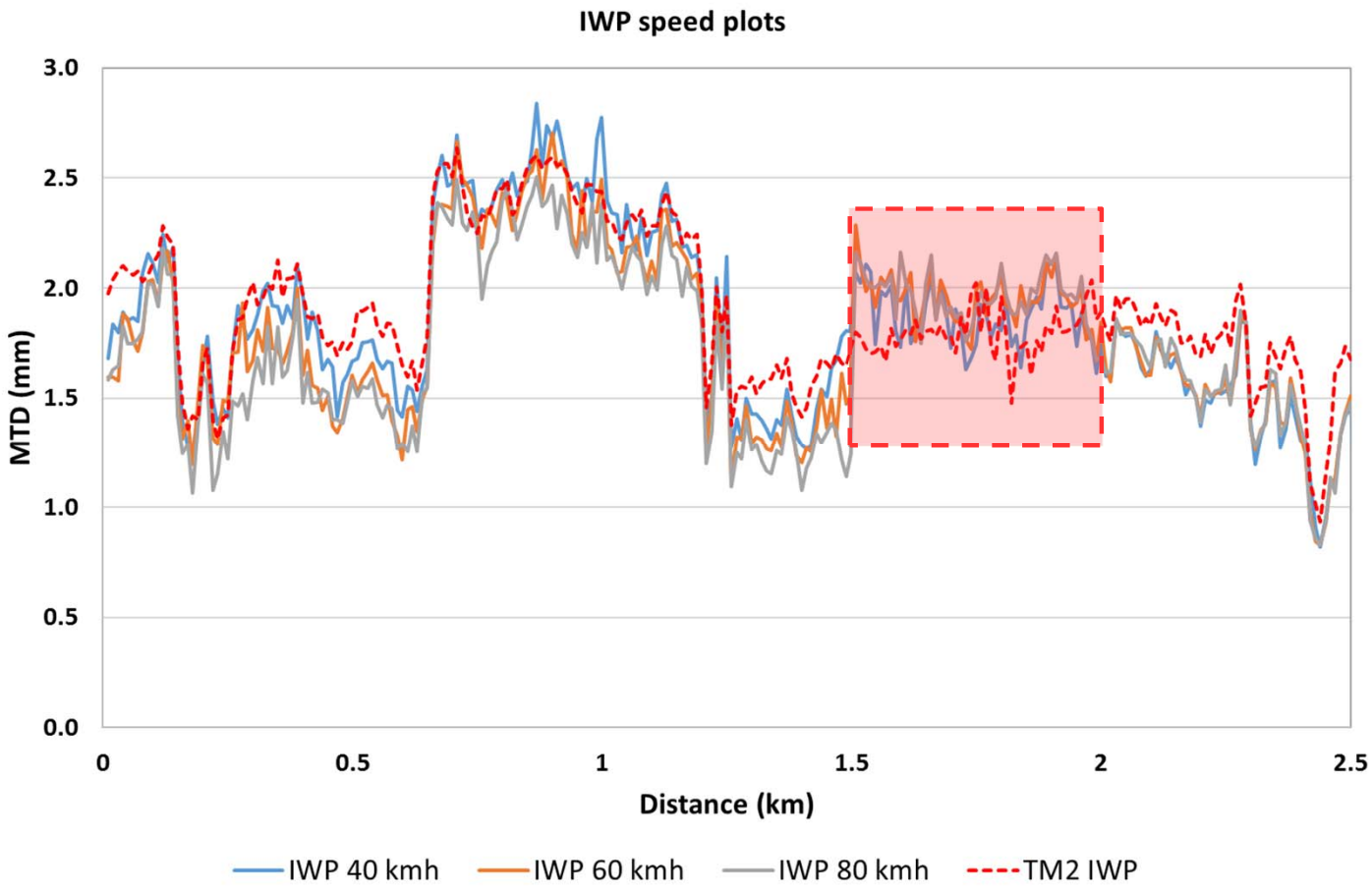
Ground-truth comparison

- Reference device: TM2
- Uses a 100mm wide line laser
- Reports MPD every 10m



$$MTD = 0.8\,x\,MPD + 0.2$$

3D versus ground truth



Some more statistics – 3D versus ground-truth

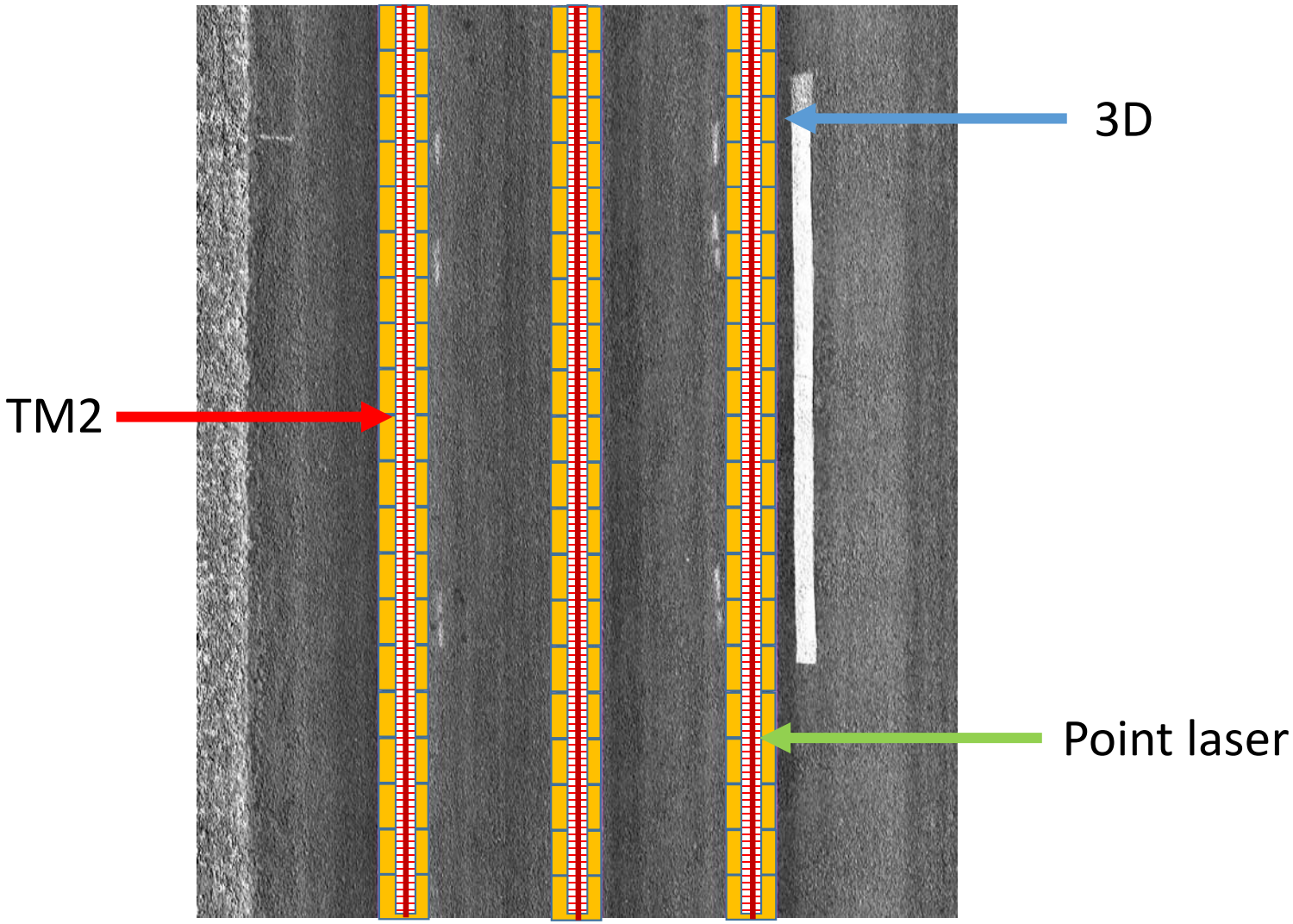
MTD	40 kmh			60 kmh			80 kmh		
	IWP	BWP	OWP	IWP	BWP	OWP	IWP	BWP	OWP
r-squared	0.85	0.94	0.93	0.72	0.85	0.77	0.72	0.85	0.71
slope	1.11	1.02	1.09	1.01	1.09	0.90	0.97	1.13	0.88
intercept	-0.27	-0.09	-0.13	-0.13	-0.30	0.09	-0.10	-0.40	0.12

Observations-1

- Good internal repeatability
- Measurements appear to be speed dependant
- High dependence on accuracy of conversion equation

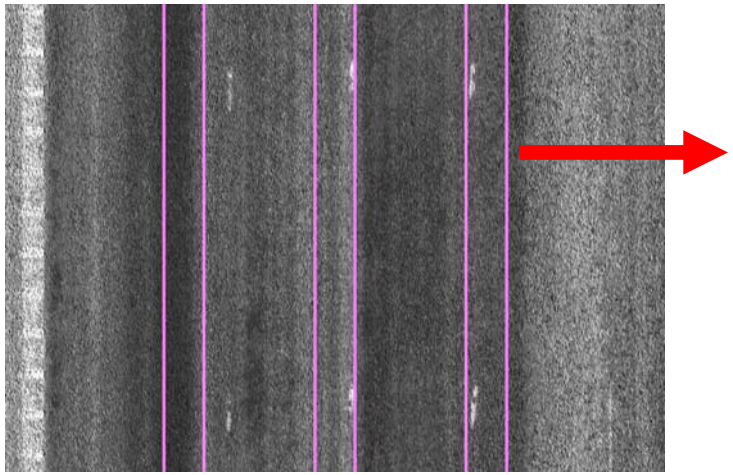
$$MTD = 0.8\ x\ MPD + 0.2$$

- Different measurement methods


3D
TM2
Point laser

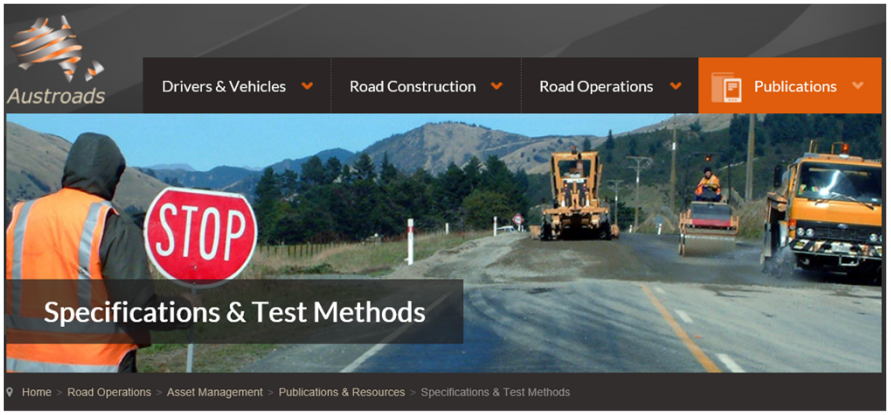
Observations-2

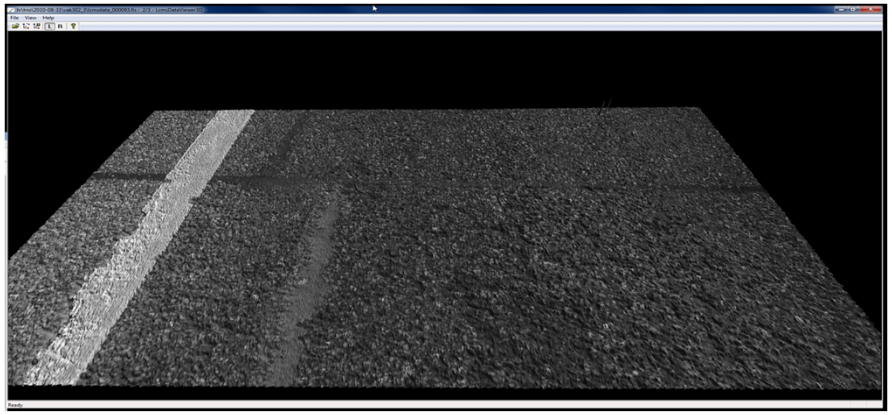
- Driver tracking (increased lateral wander at low speeds)
- Variations in surface texture across lane



Conclusions & future work

- Looks promising
- Compare outputs against point laser systems
- Assess performance in accord with Austroads test methods
- Investigate more outputs
  - ravelling





Above image courtesy of Pavemetrics

Why collect deflection data at traffic speed?

Why collect deflection data at traffic speed?

Best to use a traffic speed device

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2 May – 4 May 2018: 8th Symposium on Pavement Surface Characteristics: SURF 2018 ***'Vehicle to Road Connectivity'.***

Thanks for your attention

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