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Determination of Buildings Tilts on the Basis of UAV Photogrammetric Data

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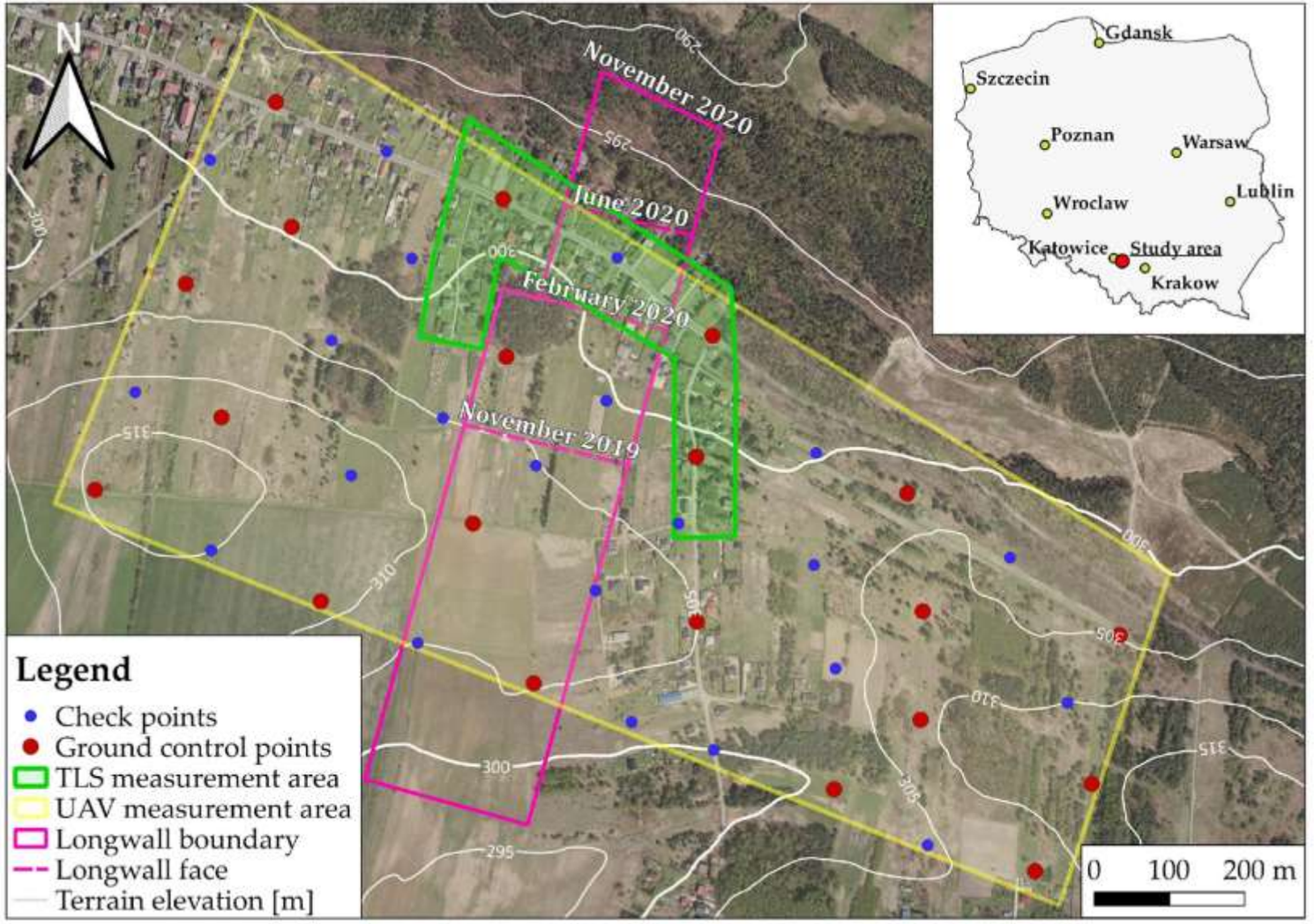
Study area

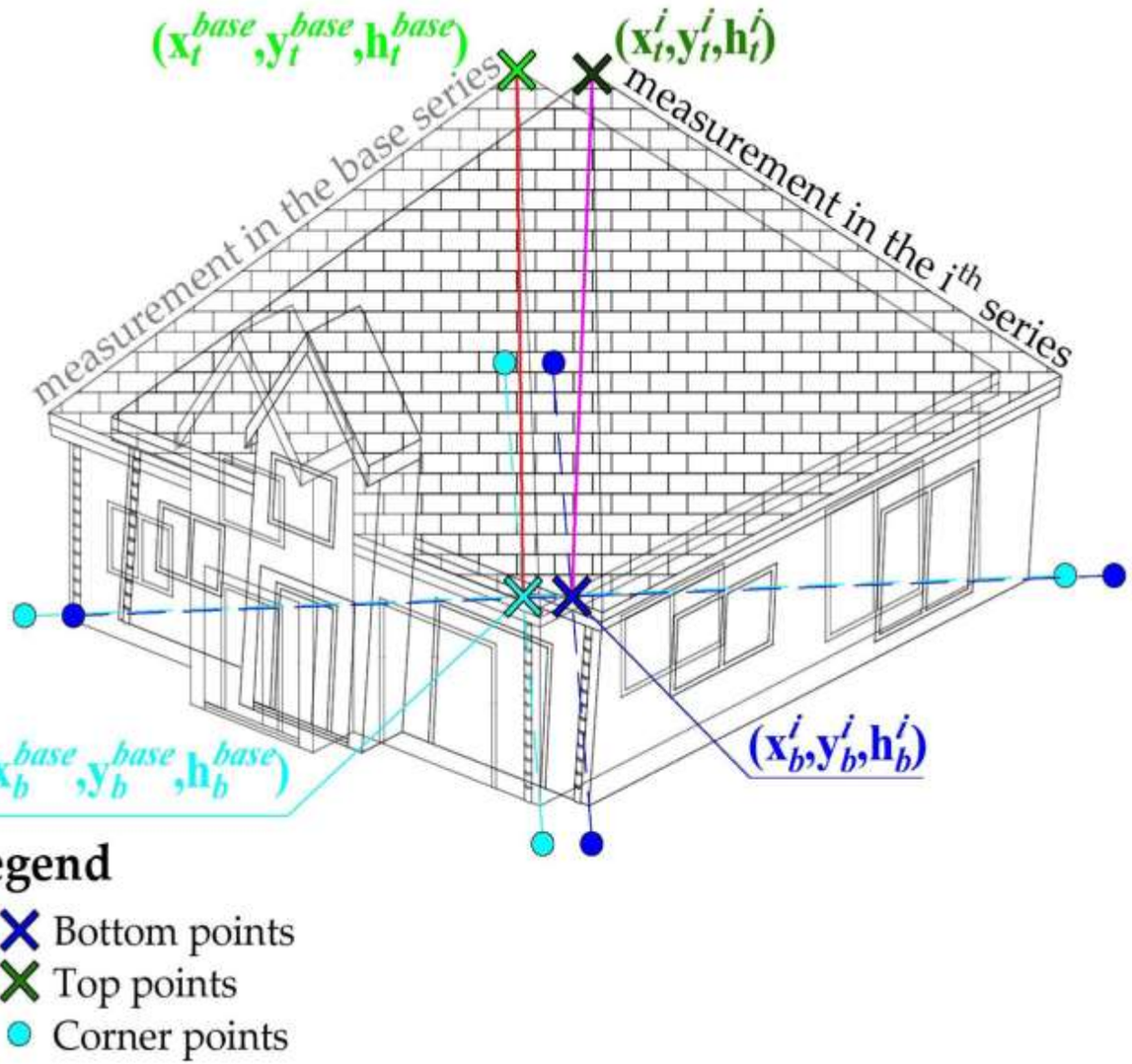


Five measurement series:

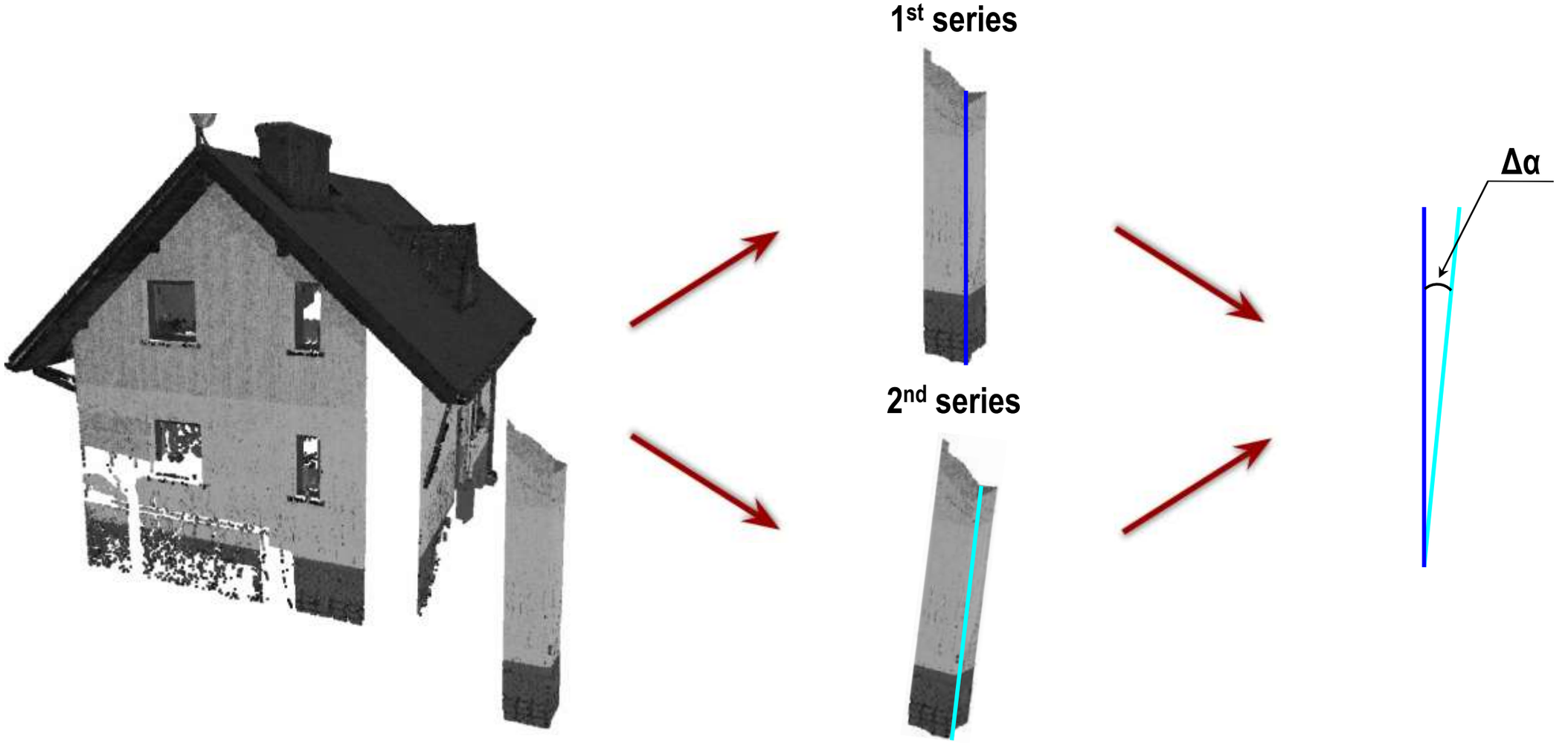
1) 2019 July (base series);
2) 2019 November;
3) 2020 February;
4) 2020 June;
5) 2020 November.

Methodology for determining changes in building

- HzDiff method uses:
  - top point
  - bottom point
  - height of building
- VDiff method uses:
  - corner points



Reference data (TLS)



Results – accuracy analysis

HzDiff method

$RMSE_X$ = 1.7 mm/m

$RMSE_Y$ = 2.1 mm/m

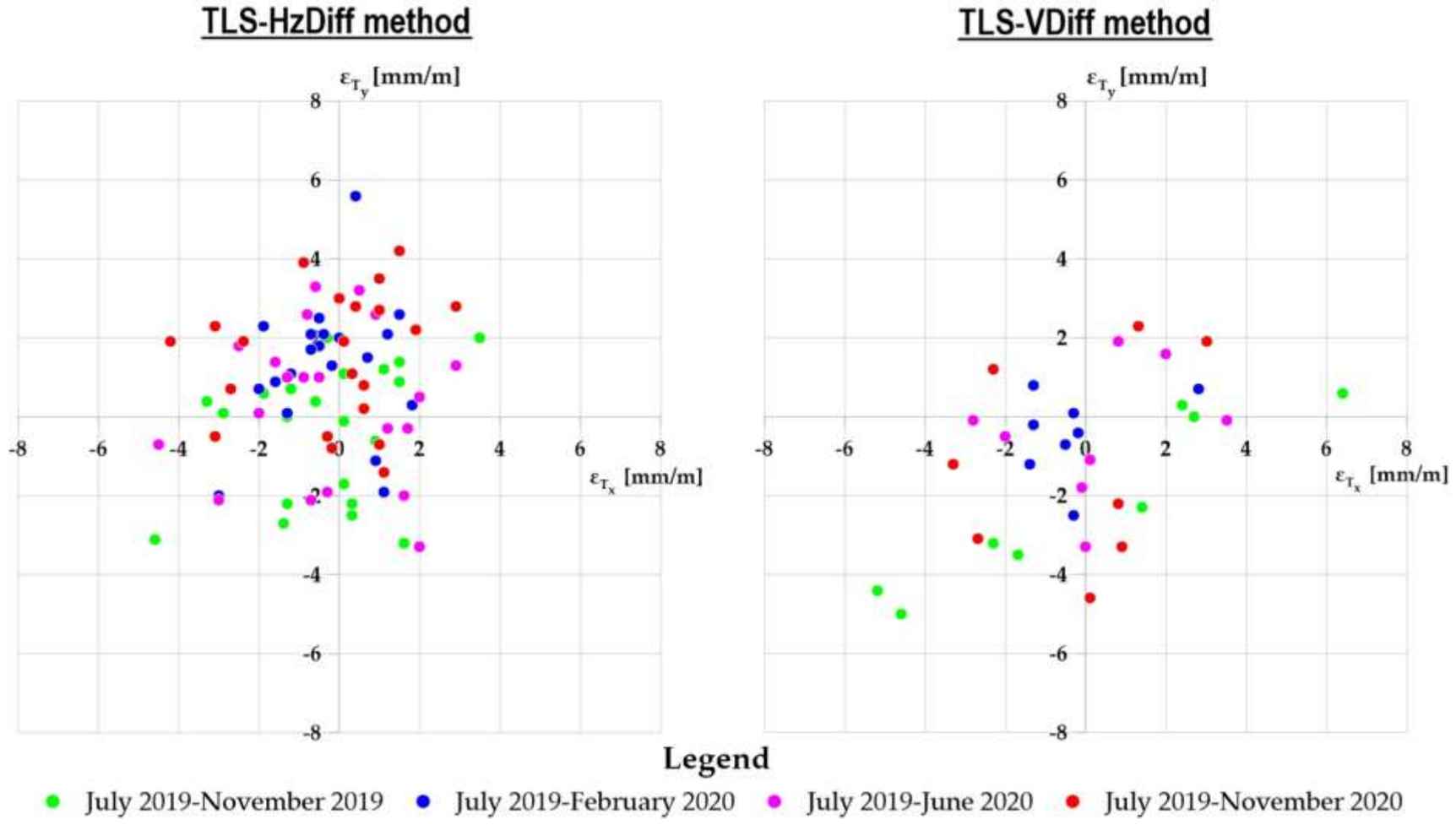
$RMSE_{XY}$ = 2.7 mm/m

VDiff method

$RMSE_X$ = 2.4 mm/m

$RMSE_Y$ = 2.3 mm/m

$RMSE_{XY}$ = 3.3 mm/m



Determining changes in building tilts based on UAV photogrammetry

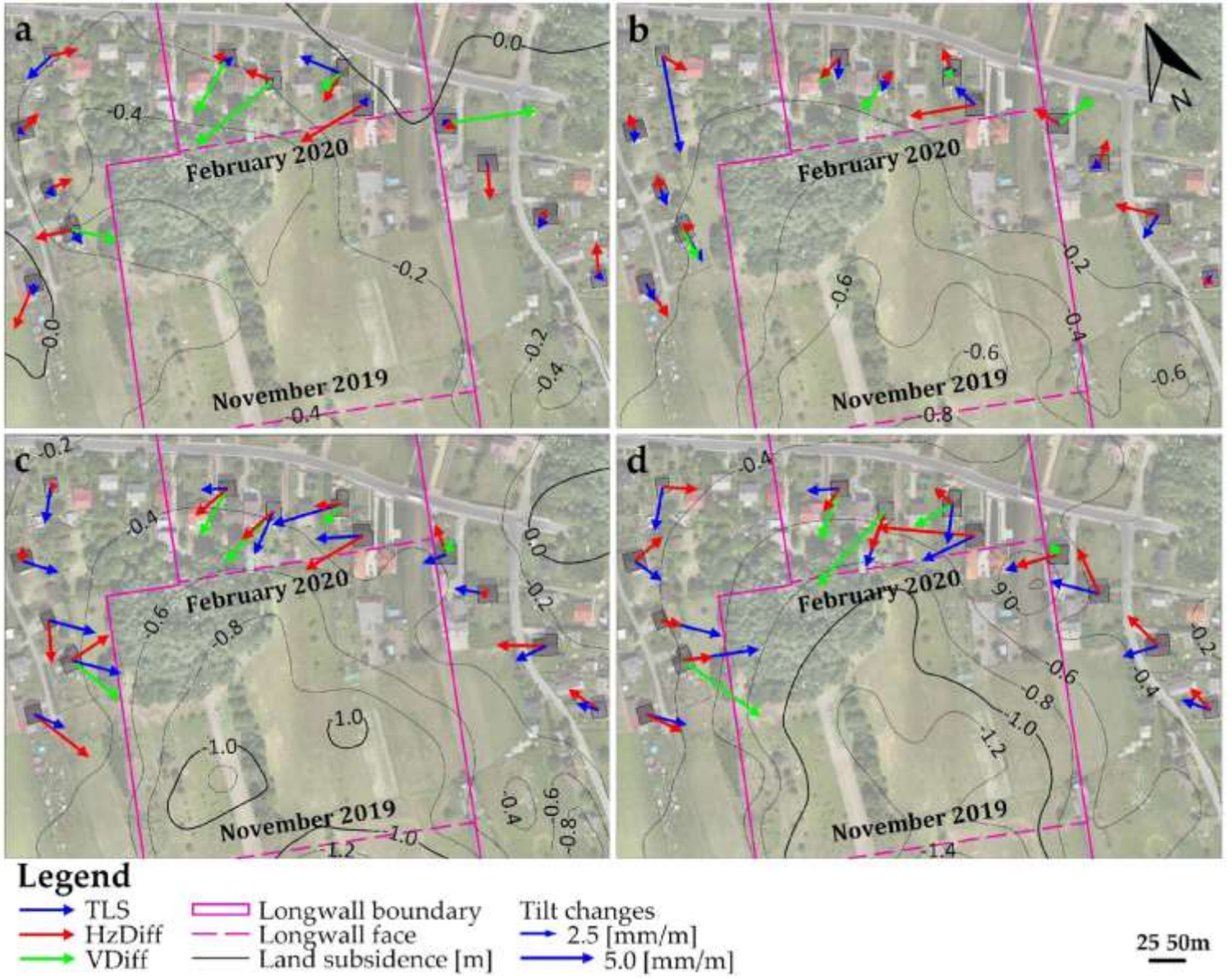
Strząbała Katarzyna, Ćwiąkała Paweł, Gruszczyński Wojciech, Puniach Edyta, Matwij Wojciech

Measurement

Surveying equipment used and photogrammetric flight parameters in subsequent measurement series

Measurement series	UAV	Camera parameters	Overlap Forward/Side [%]	Flight Altitude [m]	No. of images
July 2019	DJI S1000	Sony ILCE A7R, Sony Zeiss Sonnar T * FE 35 mm F2.8 ZA	80/60	72	2927
November 2019	DIJ S900	Sony ILCE A6000, Sony E T * FE 35 mm F1.8 OSS	80/60	87	4436
February 2020	Birdie UAV	Sony DSC-RX1RII, Carl Zeiss Sonnar T * 35 mm F2	60/60 (double grid)	76	2626
June 2020	Birdie UAV	Sony DSC-RX1RII, Carl Zeiss Sonnar T * 35 mm F2	50/70 (double grid)	76	3310
November 2020	Birdie UAV	Sony DSC-RX1RII, Carl Zeiss Sonnar T * 35 mm F2	50/70 (double grid)	76	3675

Results


a
b
c
d
February 2020
November 2019
N
Legend
TLS
HzDiff
VDiff
Longwall boundary
Longwall face
Land subsidence [m]
Tilt changes
2.5 [mm/m]
5.0 [mm/m]
25 50m