Supplement: Earth observation informed modelling of flash floods

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Supplementary Table 1: Flood model accuracy assessment and Manning's n value test.

Extent	Model	Mannings	F1 score	Precision	Recall	IoU
Study area	FastFlood	0.01	0.699	0.756	0.651	0.538
		0.02	0.718	0.704	0.733	0.560
		0.03	0.714	0.663	0.773	0.555
		0.04	0.708	0.640	0.792	0.548
		0.05	0.702	0.619	0.810	0.540
	HAIL-CAESAR	0.01	0.729	0.756	0.704	0.574
		0.02	0.730	0.753	0.708	0.575
		0.03	0.730	0.746	0.714	0.575
		0.04	0.728	0.734	0.723	0.572
		0.05	0.727	0.719	0.736	0.571
HEC-RAS domain	FastFlood	0.01	0.714	0.817	0.634	0.556
		0.02	0.740	0.761	0.719	0.587
		0.03	0.744	0.725	0.763	0.592
		0.04	0.744	0.701	0.792	0.592
		0.05	0.738	0.679	0.809	0.585
	HAIL-CAESAR	0.01	0.752	0.753	0.751	0.602
		0.02	0.752	0.754	0.750	0.603
		0.03	0.751	0.754	0.748	0.601
		0.04	0.751	0.752	0.750	0.601
		0.05	0.751	0.745	0.757	0.601
	HEC-RAS	0.01	0.678	0.523	0.965	0.513
		0.02	0.742	0.646	0.873	0.590
		0.03	0.735	0.669	0.816	0.581
		0.04	0.741	0.641	0.878	0.588
		0.05	0.741	0.635	0.890	0.589

	0.06	0.761	0.683	0.857	0.614
	0.07	0.760	0.682	0.859	0.613

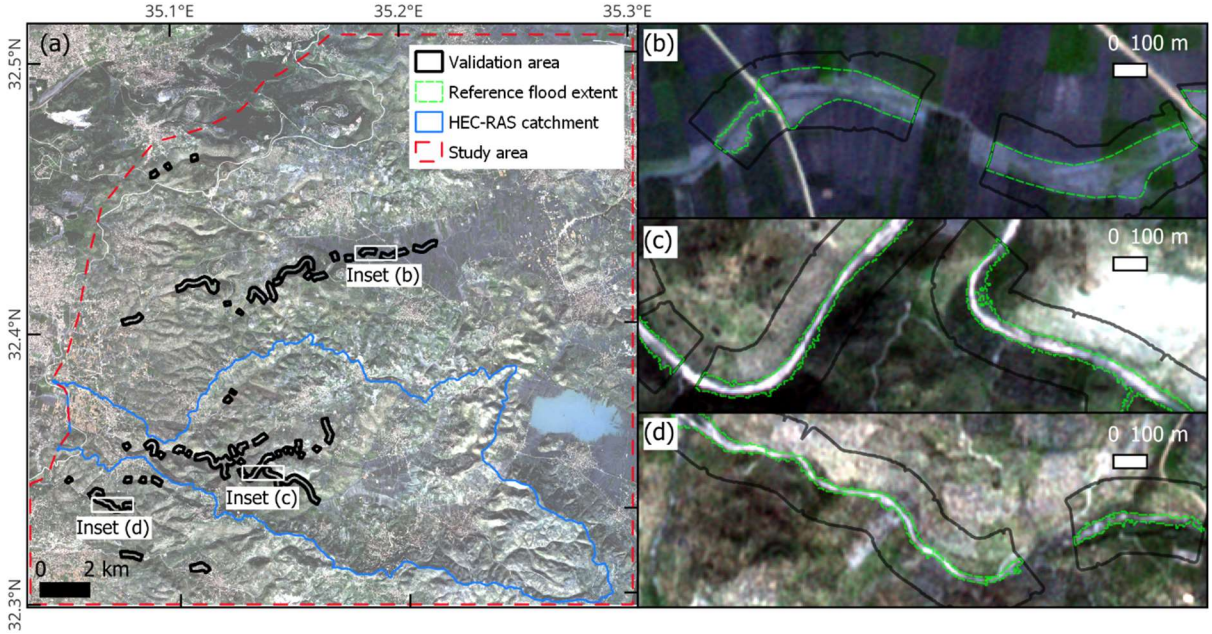

Figure S1: Validation areas containing the NDVI-derived reference flood extent. Basemap is a RapidEye-1 image (15th January 2013). Image © 2013 Planet Labs PBC.

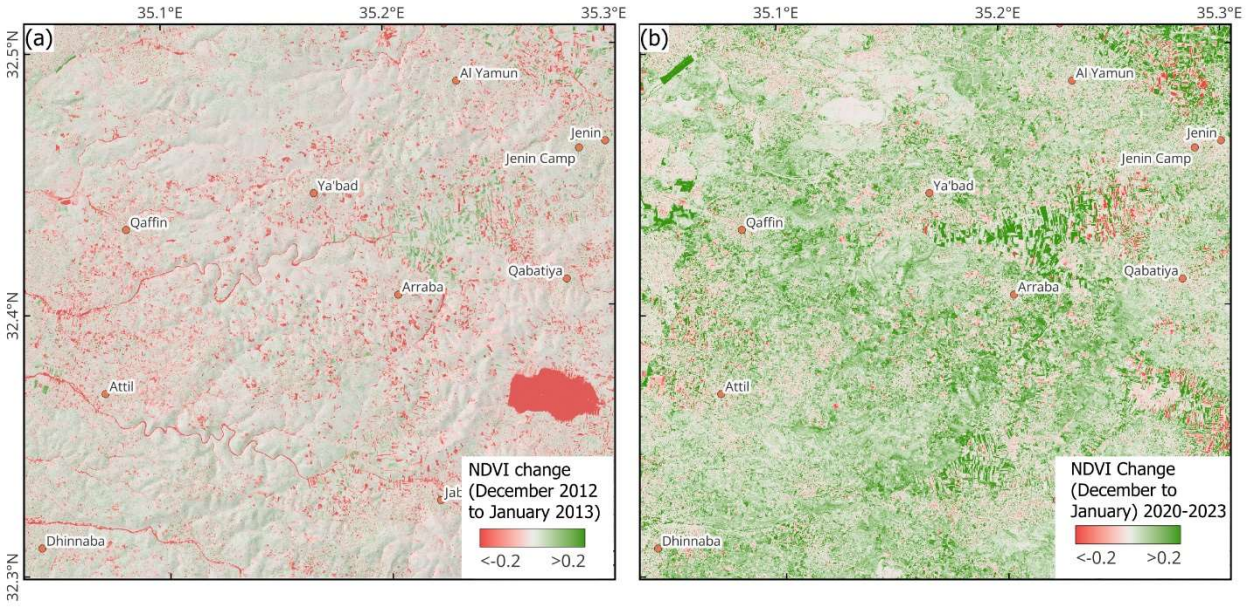

Figure S2: (a) NDVI change derived from RapidEye imagery December 2012 to January 2013. Greens represent an NDVI increase. (b) NDVI change December to January derived from monthly median composites of Sentinel-2 imagery (2020–2023)

Example HAIL-CAESAR parameter file:

```
# FILE INFORMATION
#====================
dem_read_extension:       asc
dem_write_extension:      asc
read_path:                    /nobackup/24_Nablus/future/historical_1in100/
write_path:                   /nobackup/24_Nablus/future/historical_1in100/output/
read_fname:                   input_DEM
write_fname:                  hist1in100.dat
timeseries_save_interval:     60
# SUPPLEMENTARY FILES
#======================
hydroindex_file:            hydro.asc
rainfall_data_file:         rainfall.txt
# NUMERICAL
#============
min_time_step:              0         # IN SECONDS
max_time_step:              3600      # IN SECONDS
run_time_start:             0         # ZERO UNLESS RESTARTING RUN
max_run_duration:           400       # IN MODEL HOURS, MUST BE T-1, I.E. '71' FOR 72HR SIMULATION - SORRY!
# HYDROLOGY
#============
hydro_model_only:           yes       # SWITCHES OFF THE EROSION
water_init_from_raster_on:    no        # WILL INITIALISE THE INITIAL WATER DEPTHS FROM A DEM FILE, SPECIFIED
ABOVE
topmodel_m_value:           0.003     # SEE LITERATURE FOR GUIDANCE
in_out_difference:          0         # CUMECS, UNTESTED
min_q_for_depth_calc:       0.1       # CUMECS
max_q_for_depth_calc:       1000.0    # CUMECS
water_depth_erosion_threshold: 0.01       # METRES
slope_on_edge_cell:         0.005     # SHOULD BE APPROX EQUAL TO CHAN SLOPE NEAR OUTLET
evaporation_rate:           0.0       # NOT YET IMPLEMENTED
courant_number:             0.4       # NO LOWER THAN 3 PLEASE, MAX AROUND 0.7 - NUMERICAL STABILITY CONTROL
froude_num_limit:           0.7       # CONTROLS FLOW BETWEEN CELLS PER TIME STEP (SEE DOCS)
mannings_n:                 0.03      # SEE LITERATURE FOR GUIDANCE
spatially_variable_mannings_on:    no
hflow_threshold:            0.00001    # IN METRES, DETERMINES IF HORIZ. FLOW CALCULATED
# PRECIPITATION
#==============
rainfall_data_on:           yes       # IF YES, HAVE YOU SET A RAINFALL FILE?
                             # VALUES IN MM/HR, REGARDLESS OF TIMESTEP
rain_data_time_step:        1440         # MINUTES, MUST MATCH RAINFALL FILE
spatial_var_rain:           yes       # IF YES, HAVE YOU SET A HYDROINDEX FILE?
num_unique_rain_cells:      3         # SHOULD MATCH NO. OF HYDROINDEX ZONES, COUNT THEM
spatially_complex_rainfall_on: no        # UNTESTED...
interpolation_method:       cubic      # CAREFUL NOW.
generate_artificial_rainfall:   no        # PIPE DREAM.
# WRITE OUTPUT RASTERS
#======================
raster_output_interval:     60        # IN MODEL MINUTES
write_waterdepth_file:      yes
waterdepth_outfile_name:      hist1in100_WaterDepths_
```