

Jet Propulsion Laboratory
California Institute of Technology

MAARSL: Automated Mapping and Characterization of Recurring Slope Linea from HiRISE data

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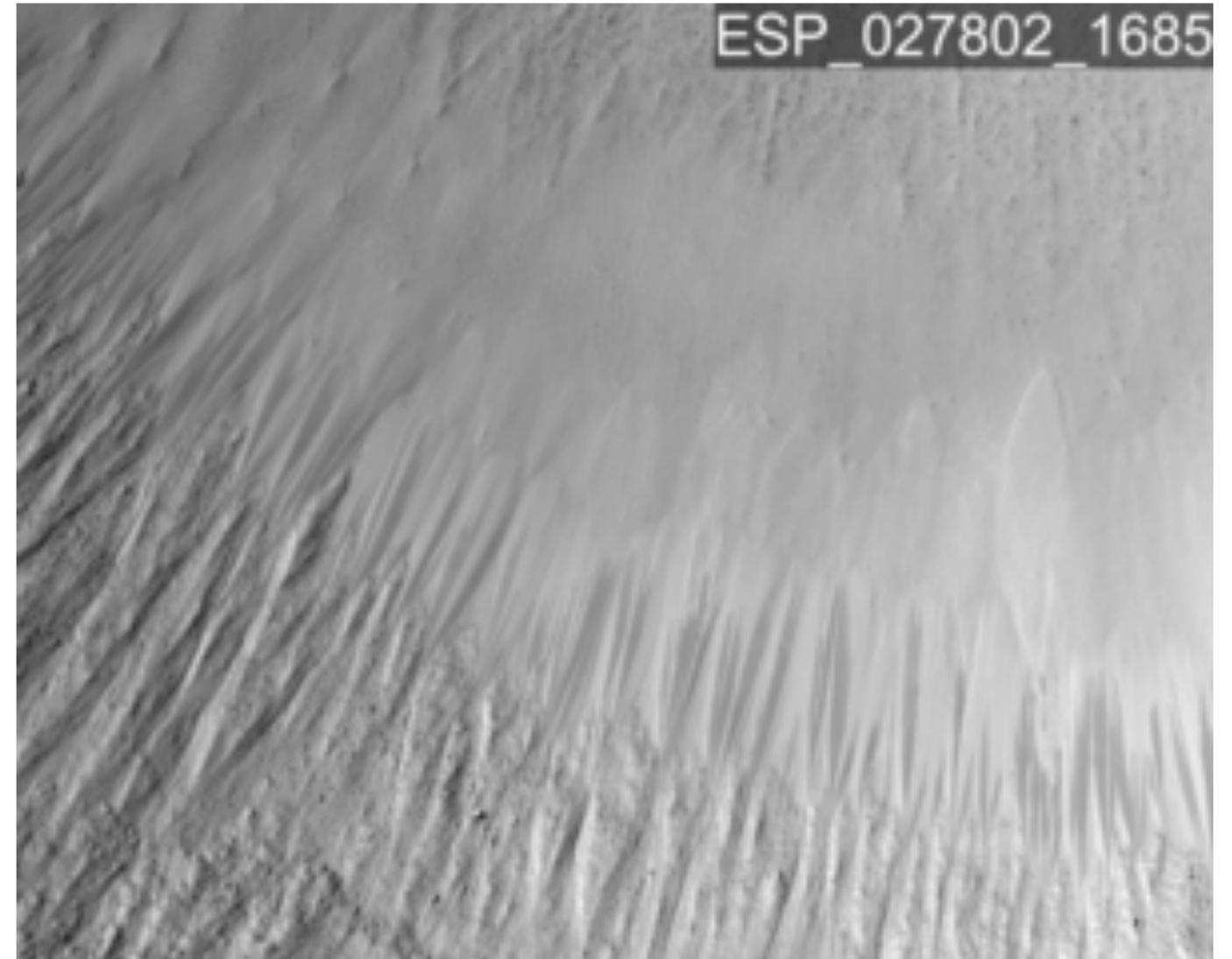
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Recurring Slope Linea (RSL)

- Narrow (0.5-5m) low albedo features, steep slopes
- Usually emerge from bedrock outcrops
- Lengthen during warm seasons, shorten/fade during cold seasons
- Formation hypotheses:
 - Water-dominated** (McEwen et al., 2011; 2014; 2015; Chevrier and Rivera-Valentin, 2012; Levy, 2012; Stillman et al., 2014, 2015, 2016; Grimm et al., 2014; Watkins et al., 2014; Wang et al., 2015; Massé et al., 2016; Chojnacki et al., 2016)
 - Subsurface briny aquifers (?)
 - Atmospheric water recharge (?)
 - Dry** (McEwen et al., 2011; Dundas et al., 2016):
 - Small scale mass wasting of thin surface material
- Manually locating all RSL in HiRISE images time-consuming and subjective



Mapping & Automated Analysis of RSL (MAARSL) System

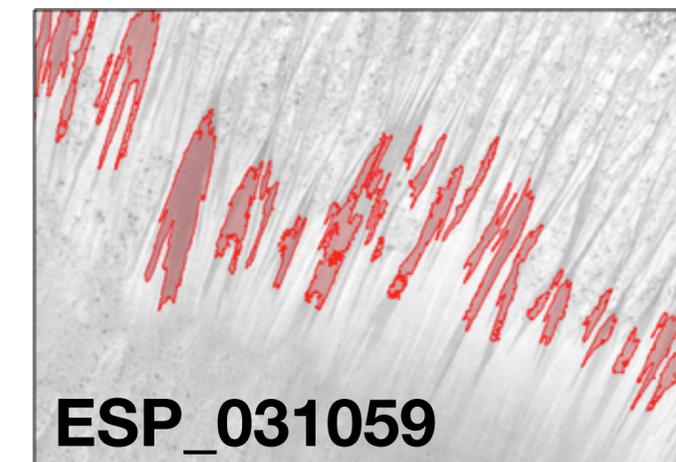
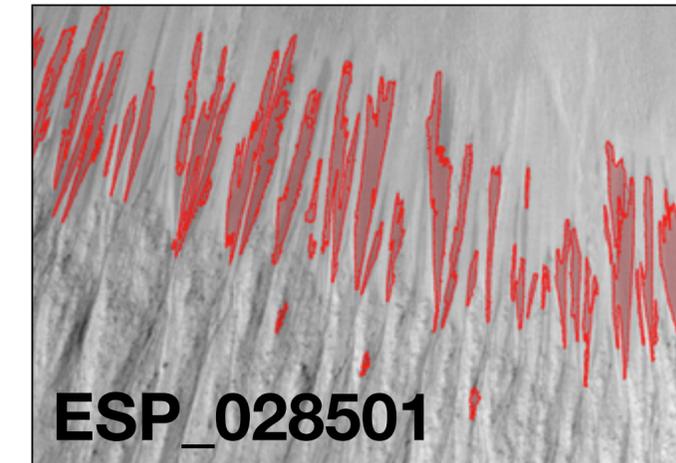
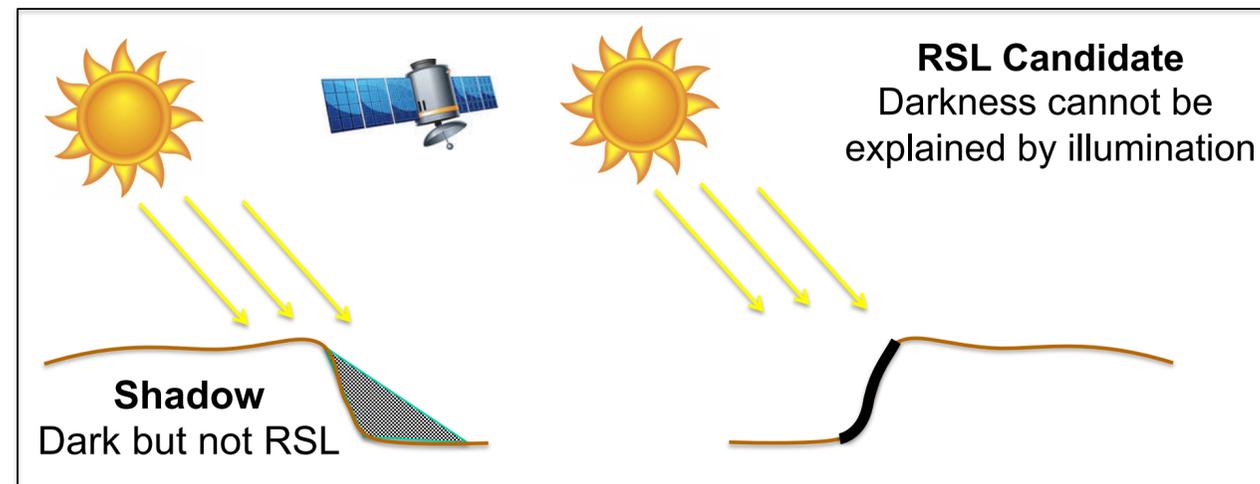
Input

Illumination Model

RSL Candidates

HiRISE Image
+ position
+ ephemeris

HiRISE DTM

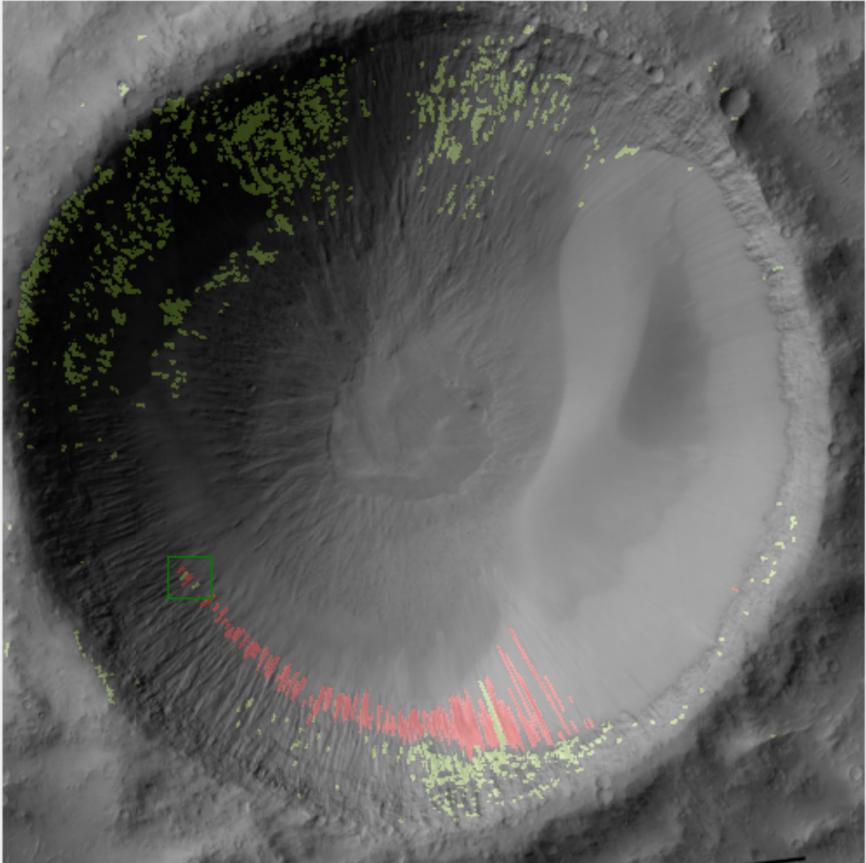


RSL Candidate Vetting via Active Learning

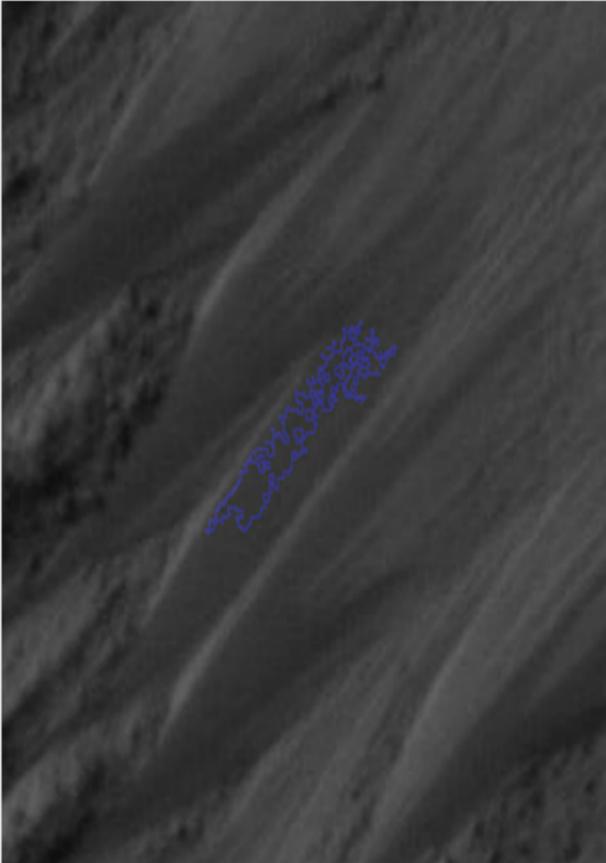
Interactive RSL Labeling GUI

Interactive Labeling of RSL Candidates

Current predictions
Predicted: 103 real, 849 spurious



Current RSL
Labeled: 11 real, 11 spurious



RSL info

RSL features (item 752):

eccentricity:	0.98
area:	1248.00
image_mean:	12.86
image_std:	5.15
image_min:	-1.75
image_max:	30.28
elev_mean:	-5136.42
elev_std:	4.20
elev_min:	-5144.79
elev_max:	-5128.08
illum_mean:	21.01
illum_std:	1.48
illum_min:	18.43
illum_max:	24.71
rough_mean:	0.05
rough_std:	0.01
rough_min:	0.02
rough_max:	0.10
slope_mean:	31.30
slope_std:	0.88
slope_min:	29.73
slope_max:	33.36
contrast:	0.06

Predicted class: real (prob 0.59)

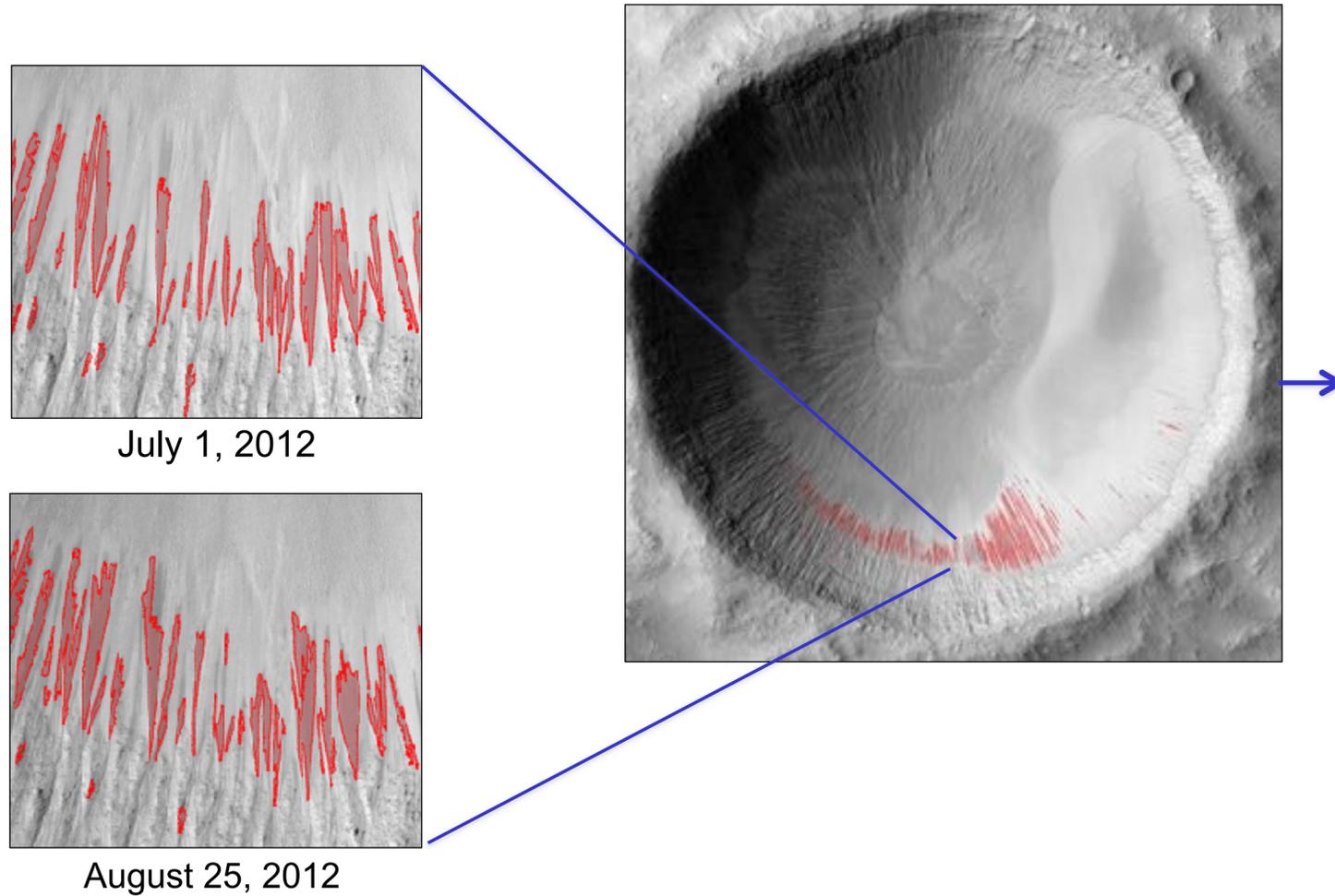
Real or spurious?

Real Spurious

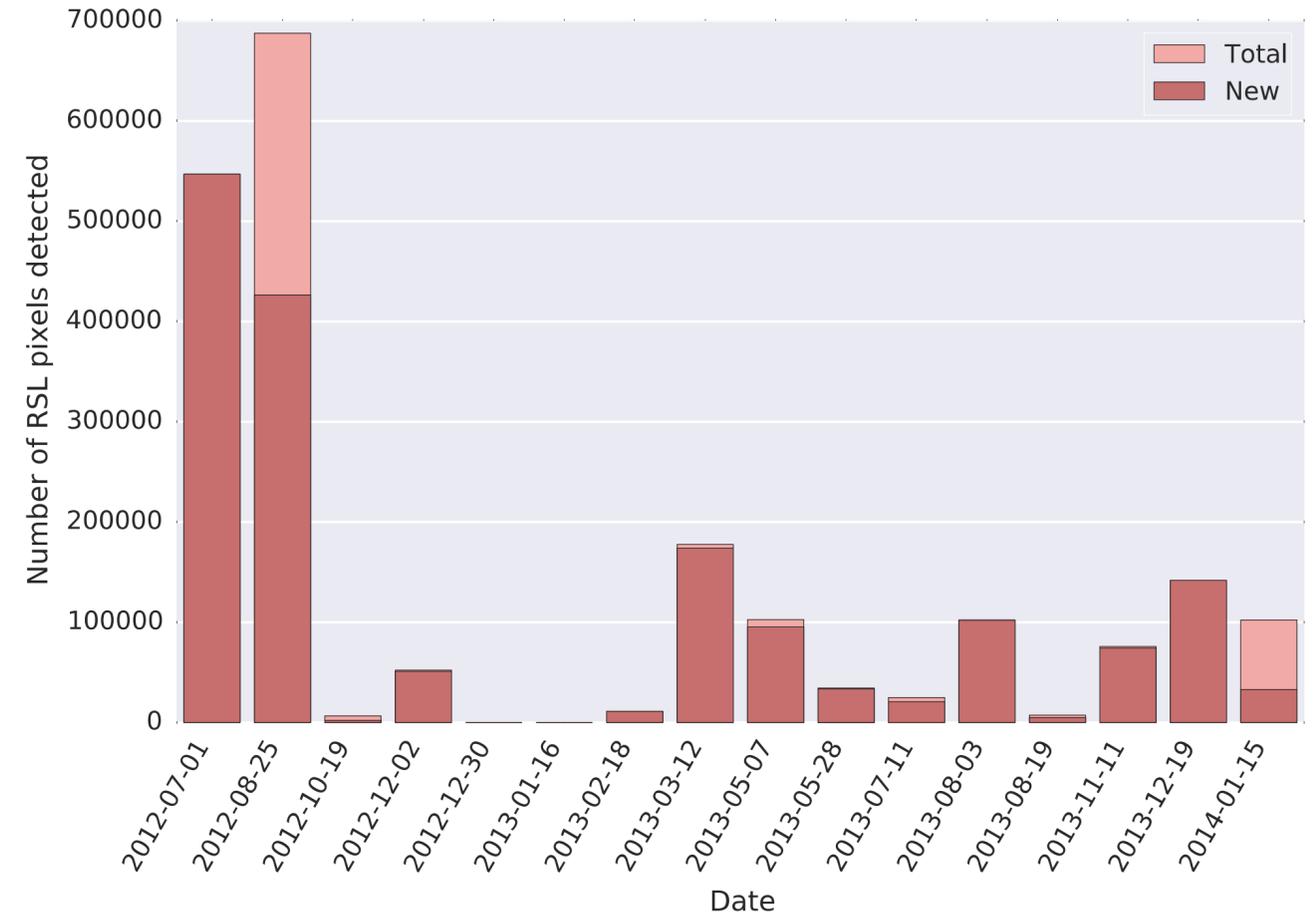
Done - save and quit

Automated Detections: Garni crater, Valles Marineris

Garni Crater



Detections of RSL Pixels in Garni Crater



Fin