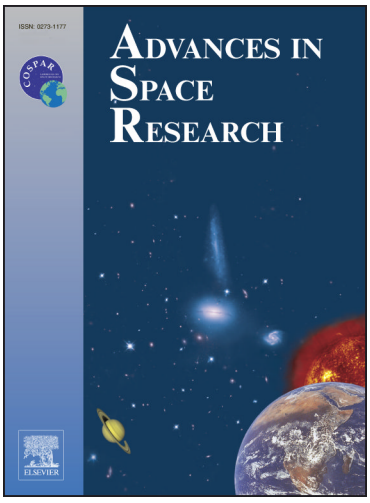

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Automatic detection of typical dust devils from Mars landscape images

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Highlights

- **An algorithm for automatic detection of dust devils from Mars images is proposed.**
- **Small or obscure dust devils are successfully extracted by the algorithm.**
- 86**% of true dust devils on images used in this study were successfully detected.**

Abstract

This paper presents an improved algorithm for automatic detection of Martian dust devils that successfully extracts tiny bright dust devils and obscured large dust devils from two subtracted landscape images. These dust devils are frequently observed using visible cameras onboard landers or rovers. Nevertheless, previous research on automated detection of dust devils has not focused on these common types of dust devils, but on dust devils that appear on images to be irregularly bright and large. In this study, we detect these common dust devils automatically using two kinds of parameter sets for thresholding when binarizing subtracted images. We automatically extract dust devils from 266 images taken by the Spirit rover to evaluate our algorithm. Taking dust devils detected by visual inspection to be ground truth, the precision, recall and F-measure values are 0.77, 0.86, and 0.81, respectively.

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