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Derivation of textural properties of the Saturn's rings with the help of laboratory measurements

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Typical variations in the opposition effect morphology of laboratory samples are investigated to probe the role of the surface structure (roughness, porosity and grain size) on the opposition effect morphology. A set of 39 previously published optical phase curves (from 0.1 to 50 degrees) is re-analyzed and fitted with several morphological and physical models. The variations of the retrieved morphological parameters (A, HWHM and S) are presented as a function of reflectance, roughness, porosity and grain size. Using several theoretical models of the opposition effect, theoretical morphological parameters are computed and compared to the observed morphological parameters. This comparison gives clues to the understanding of the opposition effect mechanisms and provide interesting results for the texture of planetary surfaces such as the Saturn's main rings for which several optical phase curves are available.

For the Saturn's main rings as well as for laboratory samples, the observed morphological parameters of the surge (A and HWHM) are found to have a non-monotonic variation with the single scattering albedo. These variations are discussed in the framework of the coherent backscattering and shadow hiding mechanisms and imply an albedo-dependency in the coupling of the two mechanisms.

The problem of the non-monotonic variations of the opposition surge parameters is also transposed to the thermal phase curves of the Saturn's rings.