Characterization of physical and chemical parameters of Guiana shield surfaces
Application to geological & regolith mapping

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Motivations

- In the context of limited outcrops, new approaches may be developed to identify the nature of the bedrock from recent remote sensing data.

- Geomorphology – Preliminary results in West Africa and previous works in the Guiana shields (Kroonenberg and Melitz 1983, Bugnicourt et al. 2018) indicate the potential of quantitative geomorphological approaches (=> multi-scale roughness mapping).
Suriname geology & roughness

Bakhuis Granulite Gneiss

Proterozoic
- Muri Alkaline Complex
- Avanaverro and Käyser Dolerite
- Tafelberg Formation
- Kabalebo Charnockite
- Lucie Gabbro and Bemau Ultramafitite
- Coppename Muscovite Granite
- Wonotobo Granite and Sipaliwini Leucogranite
- Dalbana Formation
- Coeroeni Gneiss Belt: Dome Hill Gneiss
- Coeroeni Gneiss Belt: Amotopo Gneiss
- Coeroeni Gneiss Belt: Werekitto Gneiss
- Bakhuis Granulite Belt: Stondansi Gneiss
- Bakhuis Granulite Belt: Bakhuis Granulite
- Gran Rio Granite
- Pikien Rio Pyroxene Granite
- Sara’s Lust Gneiss
- Greenstone belt, Rosebel Formation
- Greenstone belt, Patamacca Granite
- Greenstone belt, Armina Formation and Taffra Schist
- Greenstone belt, TTG, Kabel Tonalite
- Greenstone Belt, Paramaka Formation

Geologic map from Kroonenberg et al. 2016
Suriname geology & roughness
Suriname geology & roughness

Geologic map from Kroonenberg et al. 2016
Motivations

- Geostatistical analyses of radiometric data – WAXI experience in the WAC
- Variograms modified by superficial processes
- Potential to distinguish in-situ from transported regolith


- Slope
- Roughness
- K, Th, U maps
- Radar data
- Imagery
- Geophysics

Machine learning
Motivations
Module objectives - methodological developments

- Regional quantitative morphology (multi-scale roughness maps)
  Based on SRTM data 1”/pixel and 3”/pixel denoised

- Regional geostatistical analyses of radiometric data

  Chemical dispersion indices
  Geostatistical analyses from airborne radiometrics

  Multi-scale automatic extraction of geostat. parameters
  Maps + interpretation

  Aiborne radiometrics

  Freq. distribution parameters
  Variogram parameters (range, sill, anisotropy)

- Multi-scale regional roughness maps + geostatistical analyses of airborne radiometrics & comparison with other geophysical data > support for geological & regolith mapping

- Application of similar approaches for high-resolution mapping using high-resolution geophysical data + high-resolution topographic data (Lidar)
Module Deliverables

• Multi-scale roughness map of the Guiana shield (up to 10 different baselines)

• Mapping products based on geostatistical analyses of airborne radiometrics

• Regional Interpretations and lessons for the use of similar approaches at the local scale

• Multi-scale roughness maps and mapping products based on geostatistical analyses of airborne radiometrics on key localities base on high-resolution data, and interpretation

This module may be an independent module or part of a module on structural geophysics.
Budget

- High-performance computer: 3000 €
- Software licence (ENVI): ~1000 €/y
- Field work
  Validation of remote sensing interpretations: 4000 €/y
- Participation to annual meeting and other traveling costs 5000 €/y
- Ph.D. student from South America: ~ 40 k€

Total: ~ 73 k€