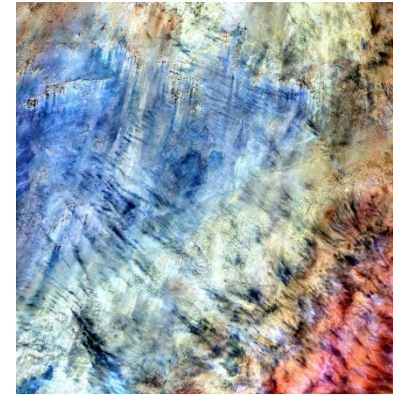
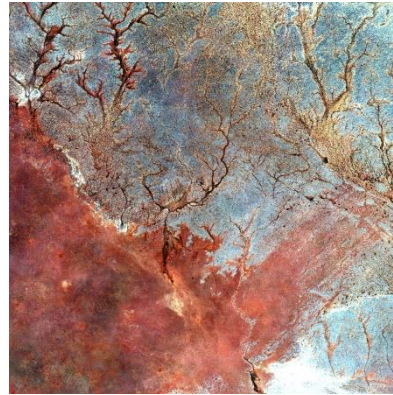


IDEPIX – IDENTIFICATION OF PIXELS



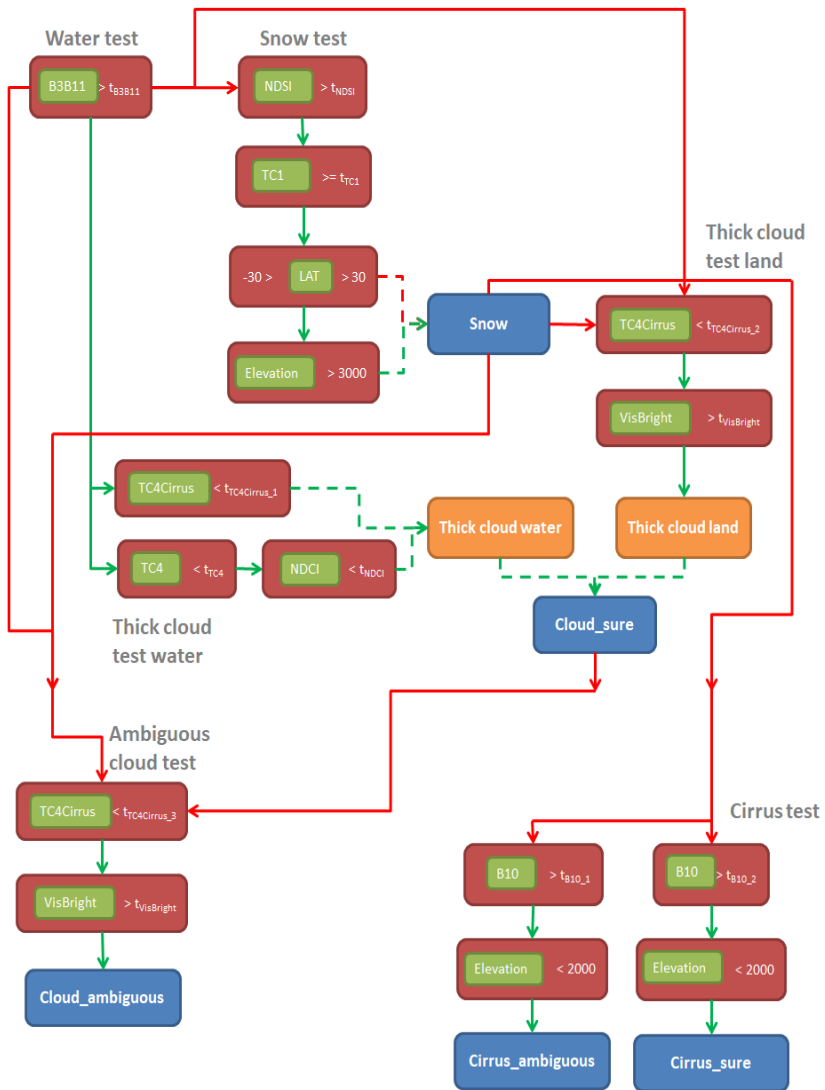
Jan Wevers, Grit Kirches, Dagmar Müller,
Olaf Danne, Carsten Brockmann, Kerstin Stelzer
Brockmann Consult GmbH



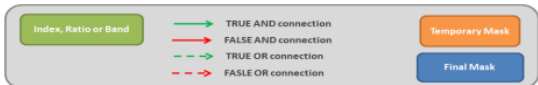
PIXEL IDENTIFICATION (IdePix) – BACKGROUND

- ▶ Identification of pixel features is a key requirement for most processing steps
- ▶ IdePix delivers a non-exclusive classification scheme for multiple sensors
 - Non-exclusive = multiple classes for one pixel can be chosen (e.g. land & thin cloud)
 - Bit coding
- ▶ IdePix is implemented in SNAP (ESA Sentinel Application Platform)
- ▶ IdePix for Sentinel-2: Mono-temporal classification approach using:
 - Spectral tests (decision tree – status during ACIX I)
 - View, sun, and terrain geometries (improvement since ACIX I)
 - Texture filtering (improvement since ACIX I)
 - Neural Network (improvement since ACIX I)

S2 PIXEL IDENTIFICATION (IDEPIX) – ACIX I VERSION



- For most processing steps, identification of clear sky pixels is important
- The major pixel attributes (=flags) are
 - Cloud
 - cloud sure,
 - cloud ambiguous &
 - cloud buffer
 - Cirrus
 - cirrus sure &
 - cirrus ambiguous
 - Snow/ Ice
 - Land
 - Water
 - Invalid
 - Cloud shadow & mountain shadow



S₂ PIXEL IDENTIFICATION (IDEPIX) – IMPROVEMENTS FOR CMIX

Step 1: Cloud top height (CTH) and cloud base (CBH) estimation as well as mountain top height (MTH) and mountain base (MBH)

- CTH=12km
- CBH: use constant CBH=0km
- MTH=altitude from DEM [km]
- MBH: use constant MBH=0km

Step 2: potential cloud shadow area identification

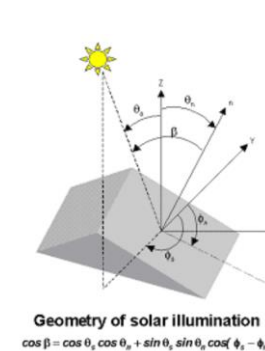
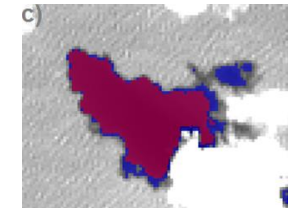
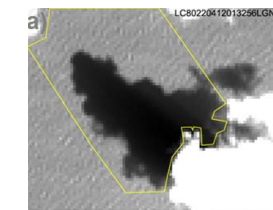
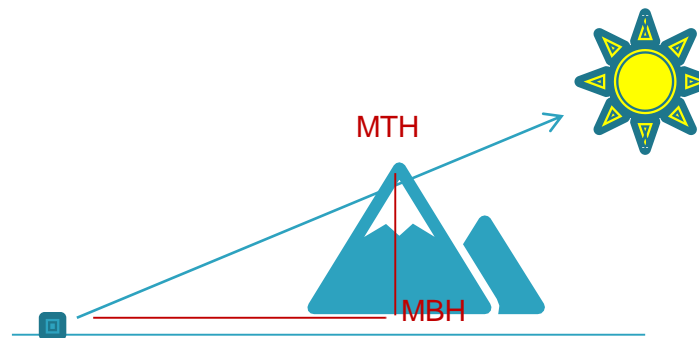
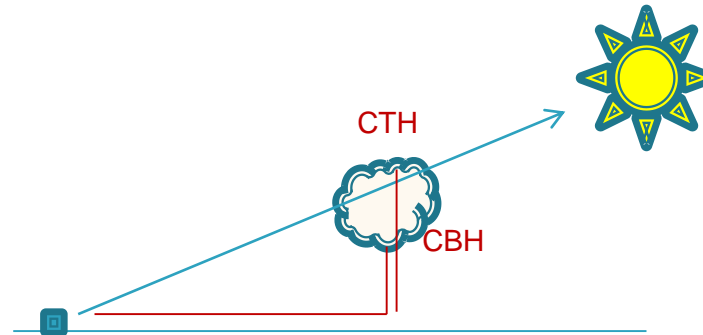
- intersection of line-of-sight with cloud
- identify connected potential cloud shadow areas (seed-growing algorithm)

Step 3: cloud shadow identification

- shift of cloud geometry along potential cloud shadow path
- find matching cloud shadow area

Step 4: potential mountain shadow area identification

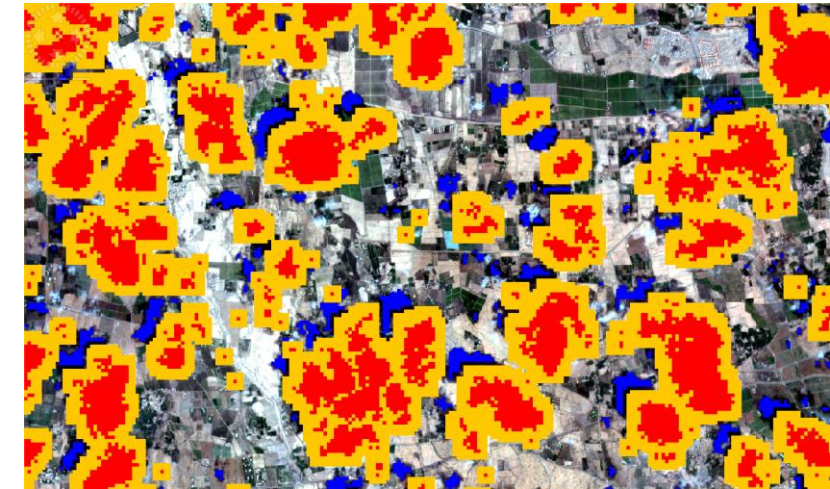
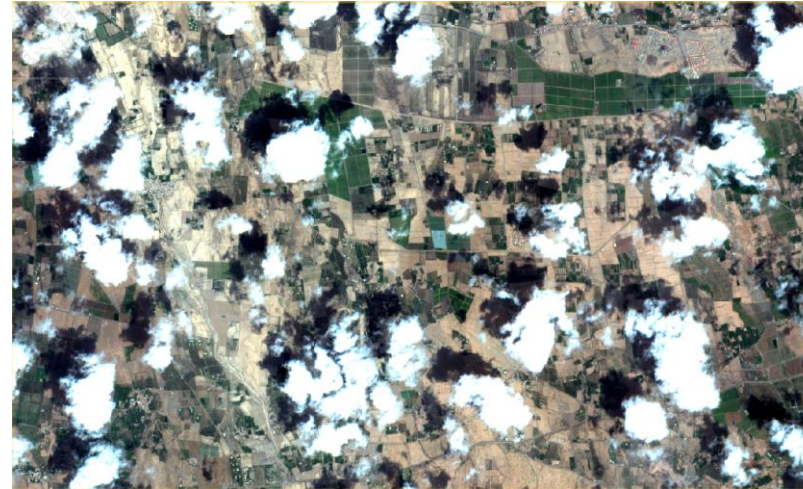
- intersection of line-of-sight with mountain
- identify potential mountain shadow areas
- calculation of the illumination angle
- identify potential mountain shadow areas, which are characterised by an illumination angle less than zero






[image taken from R. Richter and D. Schläpfer, 2016, ATCOR-2/3 User Guide, Version 9.0.2, March 2016). http://www.rese.ch/pdf/atcor3_manual.pdf]

S2 PIXEL IDENTIFICATION (IDEPIX) – IMPROVEMENTS FOR CMIX

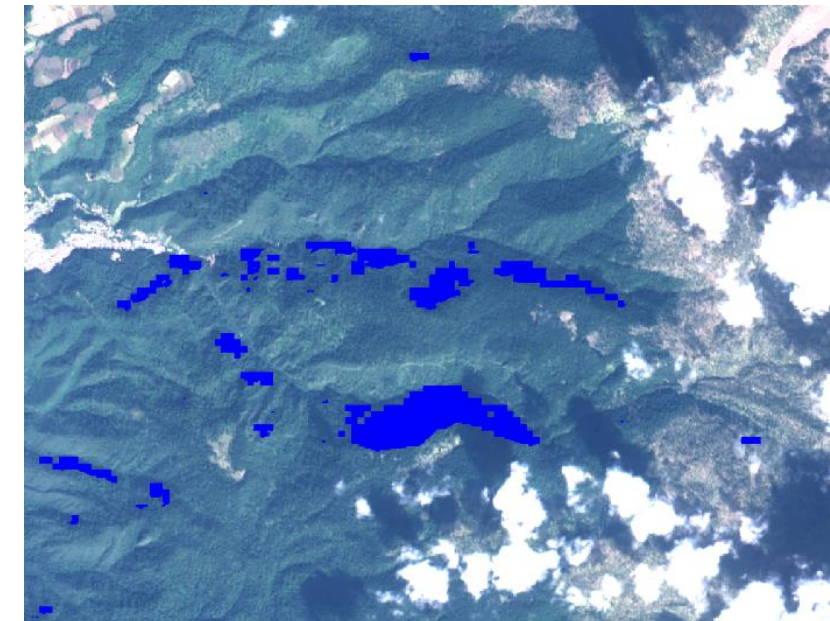
Left: Sentinel-2A L1C RGB composite



Right:

-  CLOUD SURE + AMBIGUOUS
-  CLOUD_BUFFER (orange)
-  Cloud shadow (blue)

Left: Sentinel-2A L1C RGB composite



Right:

-  Potential mountain shadow

S2 PIXEL IDENTIFICATION (IDePIX) – IMPROVEMENTS FOR CMIX

Improvement of false **urban** detection using parallax differences B7, B8, B8A and texture filtering (Method: University Trier)



Cloud = pink

S2 PIXEL IDENTIFICATION (IDePIX) – IMPROVEMENTS FOR CMIX

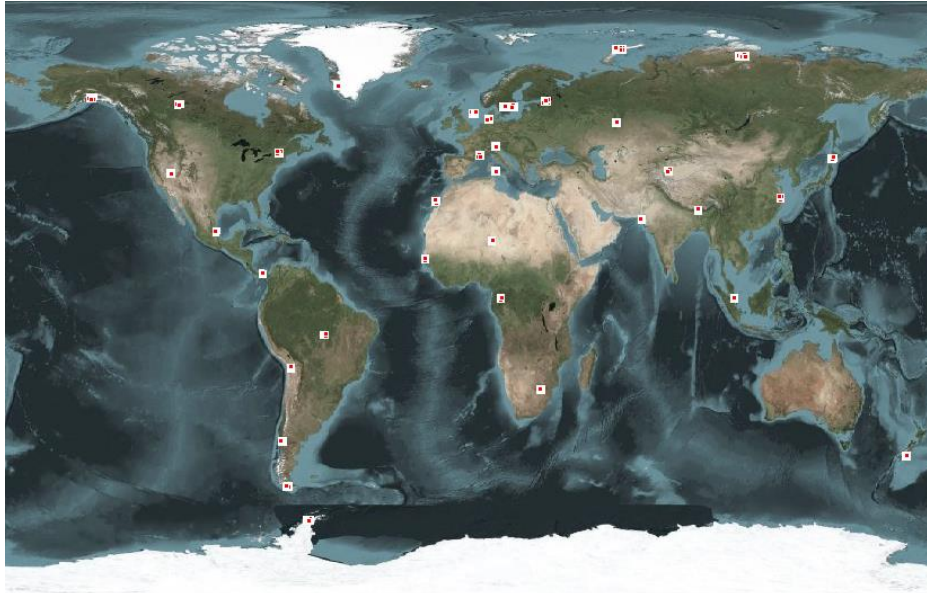
Improvement of false **urban** detection using parallax differences B7, B8, B8A and texture filtering (Method: University Trier)



Cloud = pink

S2 PIXEL IDENTIFICATION (IDEPIX) – IMPROVEMENTS FOR CMIX

Improved snow detection using a Neural Net (NN) trained with 54,000 manually collected pixels.



Cloud = pink
Snow = red

RGB



Old IdePix



IdePix incl NN



THANK YOU FOR YOUR ATTENTION!

