# MZANSI AMANZI VERSION 2 DATA INTRODUCTION

Understanding the enhanced monthly surface water extent data coverages, and the removal of cloud obscured areas, resulting from the integrated use of both Sentinel-1 (radar) and Sentinel-2 (optical) imagery.

Version 2 data release (July 2021) of the monthly water information contains a significant upgrade to the content of the each monthly dataset as a result of the integrated inclusion of Sentinel-1 radar imagery in the surface water classification methodology. The integrated inclusion of both Sentinel-1 and Sentinel-2 imagery effectively eliminates any cloud-obscured areas in the monthly water mapping (which was a product limitation when using only Sentinel-2 imagery ~ version 1 data). The capability to detect and map full water areas in each month, regardless of cloud-cover conditions improves both the accuracy and representation of surface water areas as well as the dam volumes modelled from the observed surface water extents, since full dam coverage is mapped rather than just cloud-free areas. The full history of the monthly water datasets from January 2016 to present has been re-processed to include this new radar-enhanced capability, and should ***replace all previously supplied version 1 monthly datasets***.

As per previous monthly water datasets, version 2 surface water datasets represents the combined spatial extent of both natural and man-made water features. The monthly datasets cover the historical period 2016-01 to present. Each monthly surface water extent dataset is delivered in digital, GIS compatible, raster format (i.e. GeoTIFF), based on 20m resolution cells, in Geographic Coordinates. A separate raster file is generated for each month. Water features are mapped from a combination of 20m resolution Sentinel 2 optical imagery and Sentinel 1 synthetic aperture radar (SAR) imagery. This image formats allows high detail identification and mapping of all surface water bodies in a consistent, repeatable and accurate manner. All waterbodies typically > 0.25Ha will be included in the monthly datasets.

Each cell in the monthly surface water raster datasets contains only a single information class (1) which represents the surface water observed during the reporting month (based on all accumulated satellite overpass observations in that month). *Note that this differs from the version 1 (original) monthly datasets that contained two information classes: (1) surface water observed during the reporting month (based on all accumulated satellite overpass observations in that month), and (2)*

*cloud obscured locations (where cloud cover persisted in all satellite overpass observations in that month).*

The enhanced cloud-free content of version 2 monthly surface water detection compared to cloud-obscured version 1 data content is illustrated in Figure 1.

The integrated inclusion of Sentinel-1 SAR imagery in the monthly water detection modelling has resulted in several new surface water extent data characteristics that end-users should be aware of:

- The raster-based version 2 representation of surface water extent is typically much 'tighter' than the previous outputs associated with version 1 data products. This is because of less 'bleed-out' into very saturated (rather than true water covered) areas. This especially noticeable in shallow water environments such as braided channels and/or wetland regions. The version 2 water extent is a more accurate representation of true open water extent. Note however that version 2 processes can result in the loss of some water feature edge pixels which are in reality transitional pixels between water and terrestrial surfaces. This can result in significant narrowing and even discontinuous representations of thin, linear river features; when comparing equivalent date content from version 1 and version 2 monthly water datasets (see Figure 2).

- The raster-based version 2 representation of surface water extent is typically more accurate in classifying open water areas containing non-emergent aquatic vegetation just below the water surface, which was often mis-interpreted as emergent aquatic vegetation, and thus not part of the water surface extent, with the Sentinel-2 only outputs associated with version 1 data products. The version 2 water extent is a more accurate representation of true open water extent. Note however that version 2 processes can result in the loss of water edge pixels, and thus narrower representations of linear water features such as rivers, when comparing equivalent date content from version 1 and version 2 monthly water datasets.

- The SAR component raster-based classification component in version 2 representation of surface water extent may result in some local surface water area detection losses as a result of significant surface wave conditions and associated backscatter characteristics, most likely in very large open water, or coastal and adjacent estuary areas. This localized effect is

illustrated in Figure 3, which compares Richards Bay, Durban, Knysna and Cape Town harbours, estuaries and adjacent coastlines for the same month (Feb 2021).

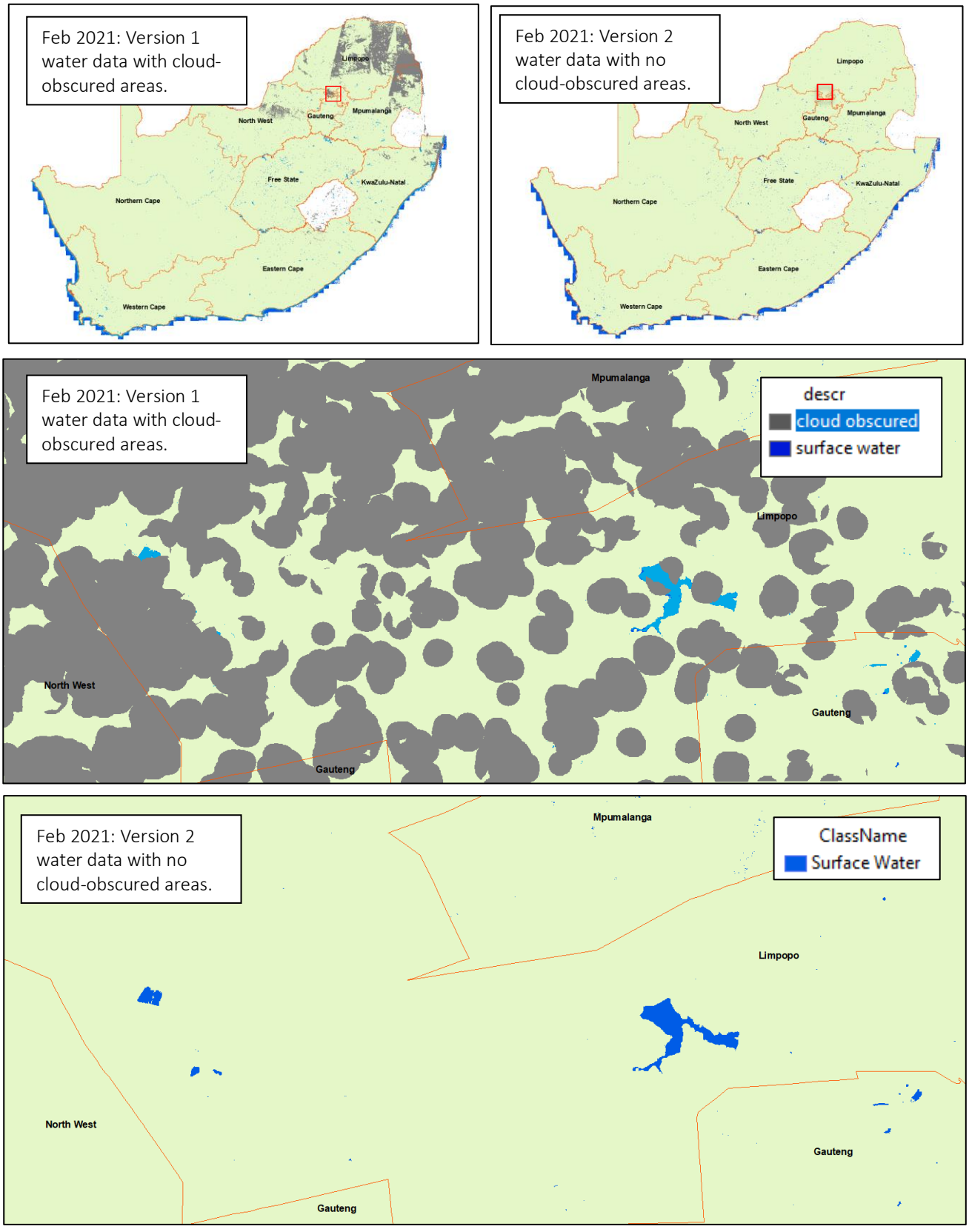


Figure 1. Comparison of integrated Sentinel-1 and Sentinel-2 enhanced monthly national surface water coverage raster data and class content, with no cloud obscured areas; with equivalent date, original Sentinel-2 only cloud obscured monthly surface water dataset (February 2021).

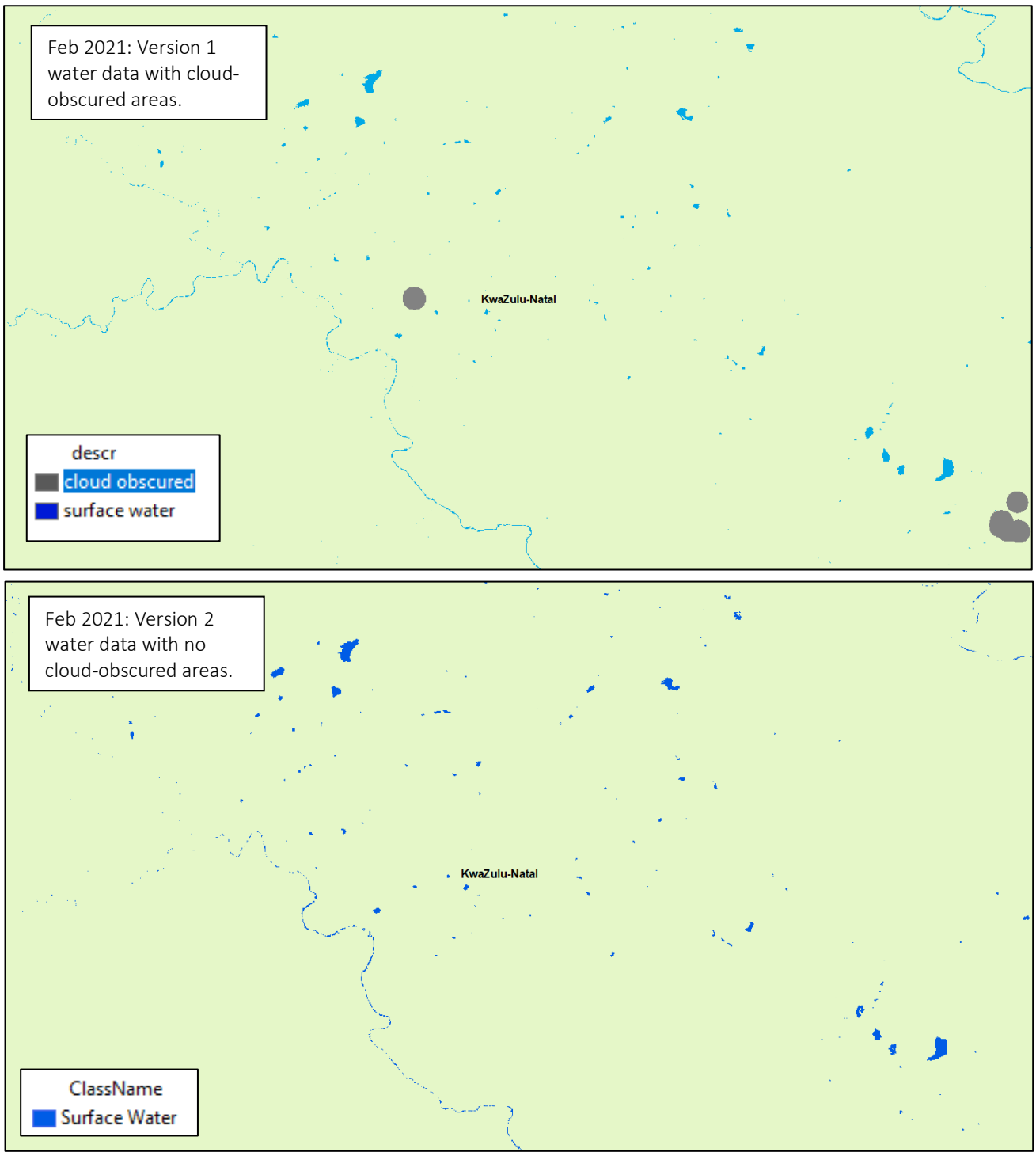


Figure 2. Comparison of narrow river feature representation mapped using integrated Sentinel-1 and Sentinel-2 enhanced modelling (version 2 product), with equivalent date, original Sentinel-2 only modelling (version 1 product), (February 2021).

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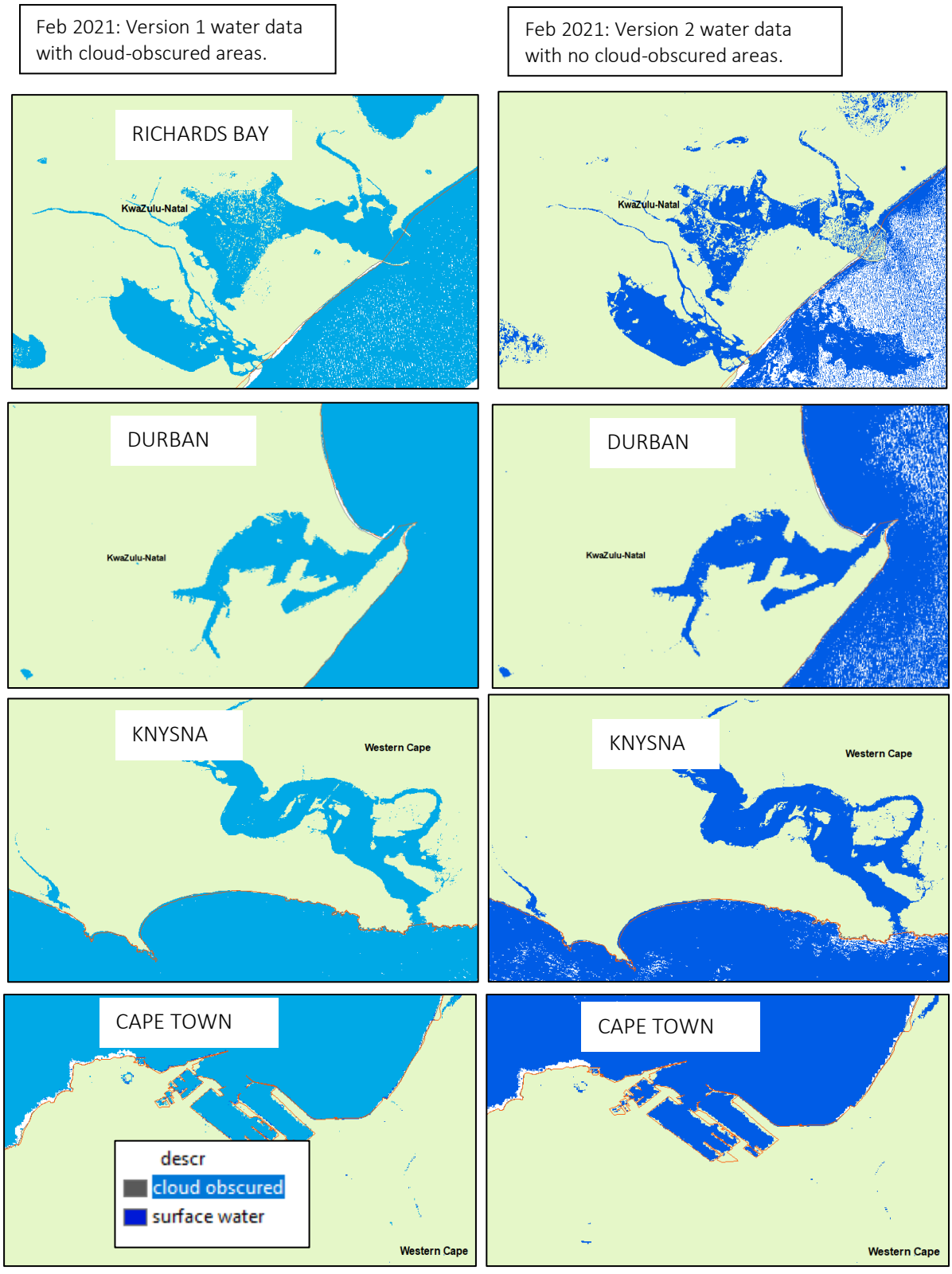


Figure 3. Comparison of coastal water representation mapped using integrated Sentinel-1 and Sentinel-2 enhanced modelling (version 2 product), with equivalent date, original Sentinel-2 only modelling (version 1 product), (February 2021); and localized wave impacts and mapping effects.