CAMELS AUS / BoM Hydrologic Reference Stations

Catchment Boundaries - Information for Users

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Purpose of document

The purpose of this document is to explain the origin the adopted CAMELS-AUS catchment boundaries, and the difference between the two versions of the BOM Hydrologic Reference Station (HRS) boundaries, namely those supplied by Australia's Bureau of Meteorology (BOM) and those derived by Keirnan directly from topographical data.

Background

As at January 2020, the BOM's Hydrologic Reference Stations (HRS) (see www.bom.gov.au/water/hrs) are not supplied with an 'official' set of catchment boundaries. The only relevant information provided by the BOM is:

1. Catchment area, supplied in the 'station facts' tab on the website;
2. Catchment boundaries displayed on the interactive map on the website; and
3. Coordinates of the station outlet (plotted in the file "HRS_BasinOutlets_fromBOM.shp").

Although BOM do not provide a download option for (2), the underlying coordinates to these boundaries can be extracted relatively easily from the relevant .json file. These were subsequently converted into a shapefile and are referred to as Set 1.

It was noticed that these boundaries were quite blocky and did not provide a lot of detail. Thus, a second method for catchment definition was trialled. This used data from the Shuttle Radar Topography Mission (SRTM), whose 1 second (approximately 30m) resolution product has been processed by Geoscience Australia into a nation-wide elevation dataset (see https://elevation.fsdf.org.au/).

In order to derive catchment areas from the SRTM, all catchment outlets had to be moved in space slightly (generally less than 200m) in order to be located where the SRTM "thinks" the stream line is. This was done subjectively, but in general a catchment outlet was moved to the cell on the stream line that was closest in terms of straight line distance.

Once the catchment outlets were all on a streamline, ArcHydro's "Delineate catchments for multiple outlets" tool was used to derive individual catchment areas for each outlet. They were later merged into a single file. This is referred to as Set 2.

However, it was not possible to derive Set 2 boundaries for the six largest HRS catchments due to computational costs. These catchments are:
- A0030501
- A0020101
- G8140040
- G9030250
- 424002
- 424201A

Which catchment boundaries are adopted?

The recommended boundaries are in HRS_Boundaries_adopted.shp. These are based on Set 2 boundaries in most cases, except for the six large catchments listed above and four cases where it is judged that the BOM supplied boundaries are likely to be more reliable (A2390519, A2390523, 307473 and 606185; see below for more details). In almost all catchments, the alternative boundaries match relatively closely, and Set 2 is preferred as it is (1) more detailed, arguably providing a more 'believable' catchment boundary; and (2) has no adjacency issues (Figure 1).

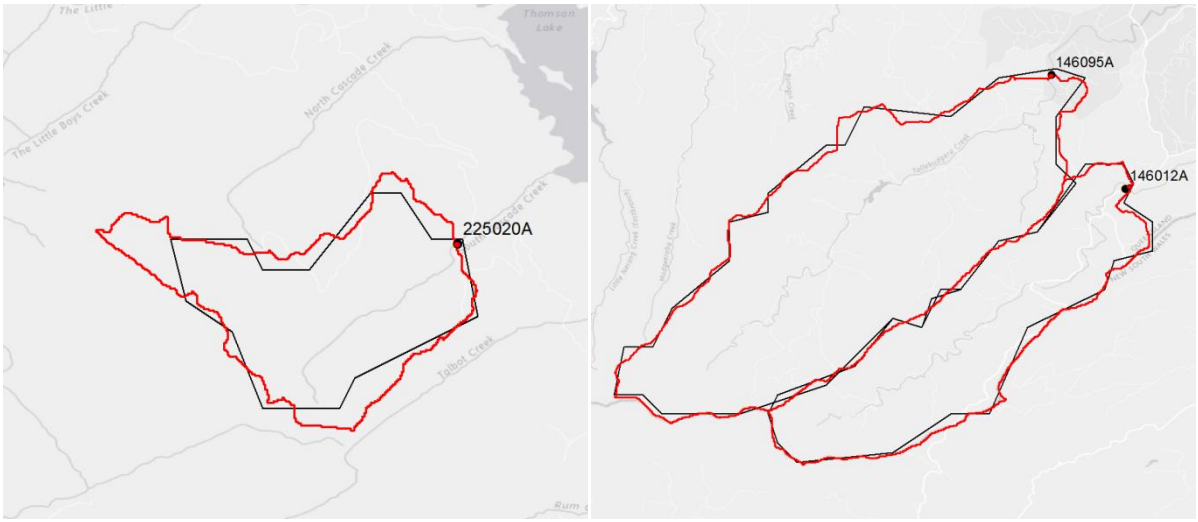

Figure 1: Comparison of alternative boundaries for small catchments (< 60km²) in Victoria (left) and South East Queensland (right). Set 1 is in black; Set 2 is in red.

Although Set 1 is closer to the official figures, Figure 2 demonstrates that neither set matches them exactly. For Set 1, this may be because BOM may have chosen to degrade the quality to allow faster viewing on the interactive map.

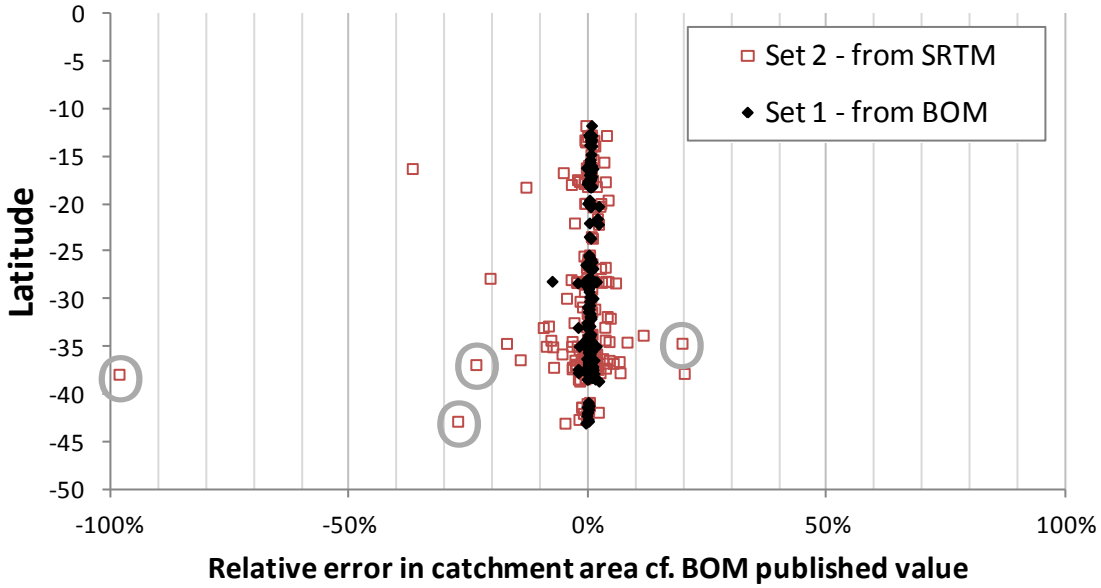

Figure 2: Relative error in catchment area compared to the catchment area published on BOM's site, plotted against latitude. A2390519, A2390523, 307473 and 606185 are circled.

In a small proportion of cases the two datasets significantly disagree (eg. Figure 3). This may be because the SRTM dataset has got the catchment delineation wrong, which is particularly likely in flat areas. Flat areas are common in Australia, and such topography makes it exceedingly difficult to define catchment boundaries. As mentioned, in A2390519, A2390523, 307473 and 606185 we have adopted the BoM boundary (black) over the SRTM-derived one. In all other cases where both sets are available, the SRTM boundaries have been judged likely to be more reliable. In the 'bonus data' directory, we provide the BOM-supplied boundaries (HRS_Boundaries_fromBOM_notRecommended.shp) along with a grid of long-term average precipitation (P_MeanAnnual_1990_2012.asc) to help users understand local climate in areas where flow paths are uncertain.

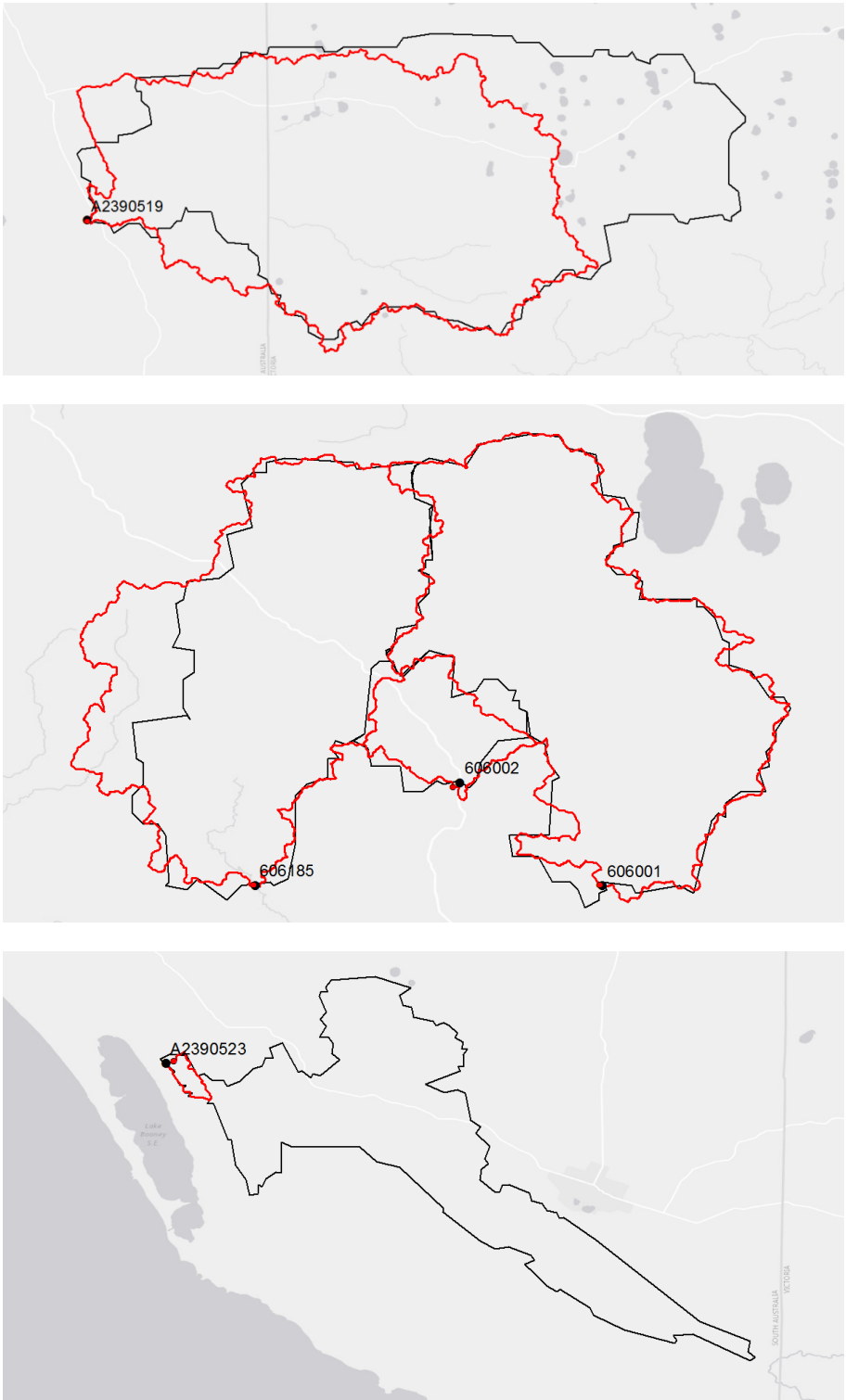

Figure 3: Examples where the Set 1 and Set 2 disagree, from the Victoria-South Australia border (top), south west Western Australia (middle) and south east South Australia (bottom). Note, in A2390519, A2390523, 606185 and 307473 (not shown) the black boundary (BOM supplied) is adopted over the red one (SRTM derived).