Discussion of the colour map for SAR interferograms

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The accurate visualization of numerical data is essential in science communication. Crameri et al. (2020) reported that unscientific colour maps which have uneven colour gradients visually distort data and can lead to misinterpretation and that scientifically derived colour maps should be used to accurately represent data. Rainbow-like colour maps, including widely used jet, is one of the unscientific colour maps. Perceptual uniformity can be quantitatively evaluated by metrics such as L (lightness), a (red-green correlative), b (yellow-blue correlative), and ΔE (incremental lightness difference) (Figure). The Scientific Colour Maps (Crameri, 2018) based on these metrics are perceptually uniform and do not visually distort data.

SAR interferometry is a technique to measure surface deformation by calculating phase differences between two or more SAR images acquired at different times at the same location. Since the phase is measured only modulo 2π, the phase difference in a SAR interferogram becomes also wrapped, cyclic data. A cyclic colour map is suitable to visualize the interferogram containing wrapped phase differences because a non-cyclic colour map generates false boundaries between $-\pi$ and π. A rainbow colour map that GAMMA software developed by the GAMMA REMOTE SENSING normally uses has been the most commonly used so far (Figure). Other software packages such as GSISAR developed by GSI and ISCE developed by NASA have also used the GAMMA-style rainbow colour map. The Headquarters for Earthquake Research Promotion (2011) introduced the GAMMA-style as the standard colour map for the wrapped SAR interferogram. The GAMMA-style has been a de facto standard for more than 20 years.

However, the GAMMA-style is not a scientific colour map based on the metrics above. I present the theoretical background of the scientific colour maps and discuss the issues in the GAMMA-style rainbow colour map and potentially alternative colour maps.

References

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