Potential of stereoscopic imagery based on Meteosat Second Generation satellites

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First studies based on stereoscopic observations from two geostationary satellites (utilizing data from GOES-East and GOES-West satellites), primarily aiming tops of convective storms, date back to late 1970’s and early 1980’s – see references below. First stereoscopic experiments with Meteosat satellites appeared in 2007, utilizing Meteosat-5, 6 and 7 at their IODC positions (63, 67.5 and 57.5 deg. E), during short periods of their parallel operations. Due to lower spatial resolution of their MVIRI instrument, stereoscopic images of full Earth disk only were utilized for demonstration of the stereoscopic effect itself, however lacking vertical extent of clouds.

With the advent of Meteosat Second Generation, after Meteosat-8 shift to 9.5°E in April 2008, new stereoscopic experiments were possible, coupling rapid scan HRV images of this satellite with corresponding images from Meteosat-9 at 0° position. Due to small distance between these satellites and imperfect timing of scan processes by both satellites, stereoscopic effect was not significant, covering only a very small region between 0° and 9.5°E.

In summer 2016, Meteosat-8 drifted to its new position at 41.5°E, for continuation of IODC services. Since October 2016, new constellation of Meteosat-10 at 0° and Meteosat-8 at 41.5°E is available for stereoscopic observations, offering extremely significant 3D effect over large area, defined by 0° and 41.5°E longitudes and wide range of latitudes, from northern Europe down to southern Africa and south-west Indian Ocean.

In this work we present scientific and application potential of MSG stereoscopic satellite imagery based on single HRV channel and/or HRV-based RGB composites. We will demonstrate techniques how 3D satellite imagery can be created for various purposes. We show examples of multiple cloud top layers, their slopes and interactions, and various convective storm-top features, such as domes, overshooting tops and above-anvil ice plumes, including possible scientific applications of these observations.

References: