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First 3D Morpho-kinematical model of a SNR. Case of VRO 42.05.01 (G 166.0 +4.3).

S. Derlopa, P. Boumis, A. Chiotellis, W. Steffen, S. Akras

“Supernova Remnants (SNRs) are the nebulae created after the violent death (Supernovae, SN) of certain stars (progenitor stars). Since SNRs are the final part of the chain of the stellar evolution, by probing them we gain valuable information about the nature and evolution of the progenitor star as well as about the explosion mechanism itself.

However, the data we obtain by SNRs observations are limited in 2-dimensions (2D). The missing information of the third dimension can be provided by 3-dimensional (3D) Morpho-kinematical (MK) models, something that contributes to a more concrete understanding of the evolutionary history of the remnant. Up to date, 3D MK modelling has been limited to Planetary Nebulae, due to their relatively small size. In this work we present the first 3D MK model of a SNR. As a study case we used the Galactic SNR VRO 42.05.01 (G 166.0+4.3), while for the purposes of our model the astronomical code “SHAPE” was employed. We present the results from our modelling and our conclusions about the origin and the evolution of this intriguing SNR. Finally, we discuss the applications of our method as a key tool to decipher the encoded information that SNRs carry about their progenitor stars and the SN explosion they originate.”