GEOLOGICAL MAPPING AND TARGET SELECTION FOR THE WESTERN OF EMINESCU (H-09) QUADRANGLE (MERCURY) IN SUPPORT TO SIMBIO-SYS INSTRUMENT OF ESA/JAXA BEPICOLOMBO MISSION. M.El Yazidi[1,2], V.Galluzzi[3], L.Giacomini[3], M.Massironi[4], [1]Center for Studies and Activities for Space (CISAS), University of Padova, via Venezia 15, 35134, Padova, Italy (elyazidimayssa@gmail.com), [2]ESTEC - European Space Agency, Keplerlaan 1, 2201 AZ, Noordwijk, The Netherlands, [3]NAF- Institute for Space Astrophysics and Planetology (IAPS), Via del Fosso del Cavaliere 100, 00133 Rome, Italy, [4]Department of Geosciences, University of Padua, Via Giovanni Gradenigo 6, 35131 Padova, Italy,

Introduction: The NASA MESSENGER space mission was able to cover the global surface of Mercury and provide a panchromatic mosaic with an average resolution of 200 m/px. The derived data from NASA MESSENGER Mercury Dual Imaging Systems (MDIS) motivated the global mapping coordinated project [1] [2] and the delivery of geological maps for the entire quadrangles of Mercury. This project aims to produce a series of 1:3M regional geologic maps to be used in support of the ESA/JAXA BepiColombo mission [3] [4]. As part of the global mapping of Mercury, is the western of the Eminescu (H-09) quadrangle [5], that runs from 72° to 108° longitudes and -22.5° to 22.5° latitudes. The morpho-stratigraphic map that we will produce, will be the first map for the western of the Eminescu (H-09) quadrangle with 1:3M output scale. This map will help to study the tectonic and geologic context, in addition to identify a list of possible targets with scientific interest to be covered in the near future by SIMBIO-SYS instruments [3] onboard the BepiColombo space mission [4]. In this work, we are updating the on ongoing mapping, display the preliminary analysis and propose a list of possible targets for ESA/JAXA BepiColombo mission to Mercury.

Data and Methods: In order to produce the morpho-stratigraphic map, we used MESSENGER/MDIS monochrome basemaps at high and low-incidence angle (BDR, HIE, HIW and LOI) bearing a resolution of 166 m/pixel, the enhanced-color and the 3-color global mosaics with a resolution of 665 m/pixel. For the topography, we utilized the US Geological Survey (USGS) Global DTM, with a resolution of 665 m/pixel. All data sets were adopted from the Planetary Data System (PDS) Imaging Node (NASA/USGS/JPL). The basemaps are georeferenced and projected in the Equirectangular_Mercury projection system, centered at the equator and 108°E. All surface features (i.e., Geological contacts, geological units, linear structures, crater crest and surface materials) have been mapped by applying the same symbology for the mapping units and the surfaces feature classifications adopted in [1], and based on the mapping standards of the USGS and the Federal Geographic Data Committee (FGDC) with some appropriate revisions, e.g. [6] [7]. The chosen 1:3M output scale for the final map was in accordance with the mapping scale at 1:400k [8]. We classified the proposed list of target in categories, type and rank based on the SIMBIO-SYS science work packages and in agreement with the BepiColombo mission goals.

Results: The preliminary mapping results demonstrate a large distribution of wrinkle ridges, lobate scarps and faults oriented between NNE-SSW and NNW-SSE [**Fig.1**]. The lobate scarps are significantly present in terrains units (i.e., intercrater, intermediate and smooth plains) and crater floor, expressing surface-breaking thrust faults.

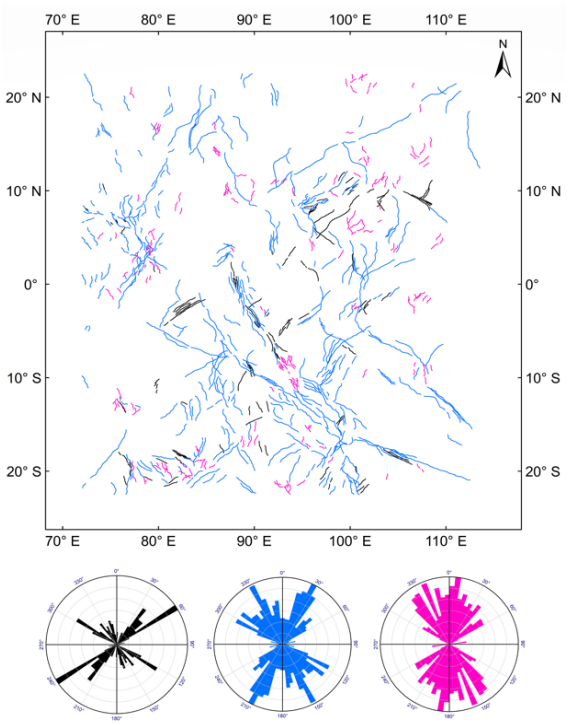

Fig.1. Map for the linear features structures distribution and polar plots for each class: Faults (black lines, N=120), lobate scarps (blue lines, N=282) and wrinkle ridges (pink lines, N= 203).

Our investigation shows that craters with 5 to 20 km of diameter are intensively distributed compared to small craters with a diameter <5 km. However, large crater of more than 20 km and old crater with degraded or buried rim are less frequent and slightly present. Large flat-floored craters with a diameter varying between 170 to 200 km displayed occasionally close to the smooth

plains or surrounded by intercrater and intermediate plain: few of these craters present smooth infilling, degraded and/or partially conserved rim, suggesting a possible resurfacing related to effusive volcanism which has been proposed to have occurred early in the planet's geological history. Frequent surface interconnection between the craters and lobate scarps is also identified. Some of the craters are significantly cut by lobate scarps, and thus they are considered a good target for understanding the different deformational events. Several old large craters (>5km in diameter) and impact basins, are presenting a swarms of wrinkle ridges within their heavily cratered floor. With the ongoing map [Fig.2] we identified and prioritized a list of 38 scientific targets as a possible site to be acquired by SIMBIOSYS instrument (i.e., HRIC, STC, and VIHI) as well as other instruments onboard BepiColombo (i.e.,MER, MIXS, TIS, MGNS, BELA and SERENA).The list of target includes sites from possible hollows deposits (18.42%), craters (42.10%), structures (23.68%), terrains (7.90%), volcanic (2.63%) and undefined features (5.26%).

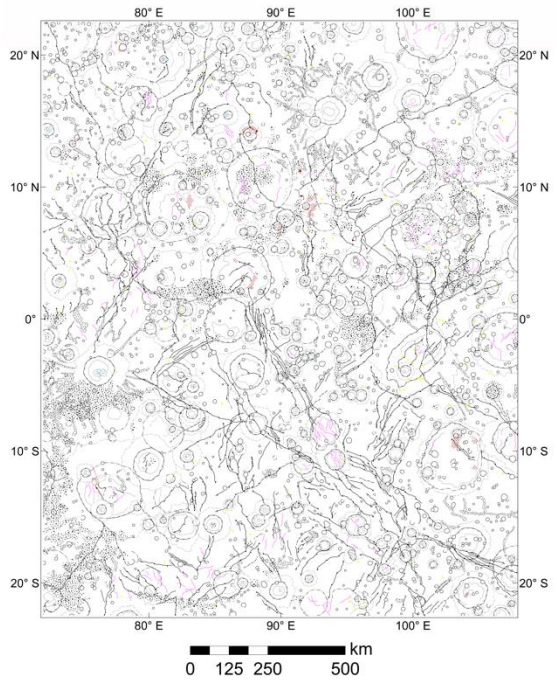

Fig.2. Morpho-stratigraphic mapping status for the western of the Eminescu (H-09) quadrangle. The linework displays the surface features, geological contacts, linear features structures, linear features morphology, and point features.

Disscussion and conclusions: Our investigation shows that the compressive tectonic features evidently had a major role in the deformational story of the western of Eminescu (H-09) quadrangle. The trending of the wrinkle ridges, lobate scarps and faults in the same orientation, from NNE-SSW to NNW-SSE suggest that these features might belong to the same tectonic event.

The global distribution of the crater size shows an important presence for crater of 5 to 20 km of diameter with fresh materials, crisp rims and well-preserved ejecta that most probably are of Kuiperian-age. In addition, some craters with a diameter that exceeds 20 km, can be categorized into two groups according to our observations: i) Craters fairly fresh, without preserved rays that most probably belongs to the Mansurian age, ii) Craters with degraded rims, smooth plains fill, and some degradation of the terraces, that seems to belong to the Calorian-age. Few large craters with partially preserved rim are superposed by numerous craters, where the ejecta is no more visible, these craters have been interpreted to be Tolstojan or the pre-Tolstojan in age.

In this work we conclude that the western part of Eminescu quadrangle was the subject of early compressive tectonic and intensive cratering processes, responsible of the intriguing heterogeneity of the terrains units that identify this district of Mercury.

Acknowledgments: The authors thank all members of the MESSENGER science and instrument teams. This work was supported by the ESA Archival Research Visitor Programme and the Centre for Studies and Activities for Space (CISAS) at the University of Padova.

References: [1] Galluzzi V et al. (2021), PGM Meeting 2021, LPI Contrib. No. 2610. [2] Galluzzi V. (2019), Springer, Cham, 207-218. [3] Cremonese G et al. (2020), Space Sci. Rev, 216, 1-78. [4] Benkhoff J. et al. (2021) Space Sci. Rev. 217, 1-56. [5] El Yazidi M et al. (2021), EPSC, EPSC2021-682. [67] Galluzzi V et al. (2016), J. Maps 12 (1), 227-238. [7] Wright J et al. (2019), J. Maps, 15 (2), 509-520. [8] Skinner J.A. Jr. et al (2019), USGS Open-File Report 2019-1012.