The SR4IS project deals with the problem of improving the spatial resolution of hyperspectral data from the PRISMA mission of the Italian Space Agency. For this purpose, higher spatial resolution data from the Sentinel-2 (S2) mission are exploited. S2 is a wide-swath and fine spatial resolution satellite multispectral imaging mission of the European Space Agency (ESA) developed in the framework of the European Union Copernicus program.

S2 images include ten bands at 10 m and 20 m spatial resolution that are used to accomplish the PRISMA superresolution (SR) task. Specifically, during the project a new end-to-end procedure, called PRISMA-SR has been developed, that starting from the S2 data and the low resolution PRISMA image, provides a super-resolved image with a spatial resolution of 10 m and the same spectral resolution as the PRISMA hyperspectral sensor.

The first step of the PRISMA-SR procedure consists in fusing S2 data at different spatial resolutions to obtain a synthetic MultiSpectral image with 10 m spatial resolution and 10 spectral bands. Then, an unsupervised procedure is applied to co-register the fused S2 image and the PRISMA image. Finally, the two images at different spatial resolutions are properly combined in order to obtain the super-resolved hyperspectral image. Solutions for each step of the PRISMA-SR processing chain have been defined and analysed during the project. The effectiveness of the PRISMA-SR scheme has been tested on simulated data. Furthermore, real S2 and PRISMA images have been finally considered to test the PRISMA-SR procedure in a real application domain.

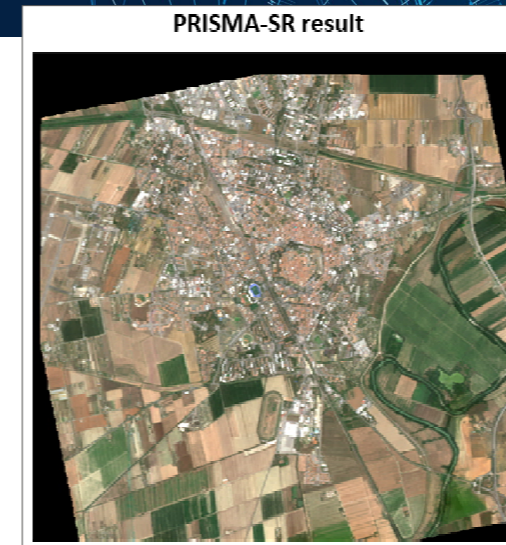| Technical Sheet |
| --- |
| **Funding institution:** |
| *Italian Ministry of Defence (MoD)* |
| **Project partners** |
| *University of Pisa, National Research Council* |
| **Project duration** |
| *June 2021 - June 2022* |
| **Involved countries** |
| *Italy* |
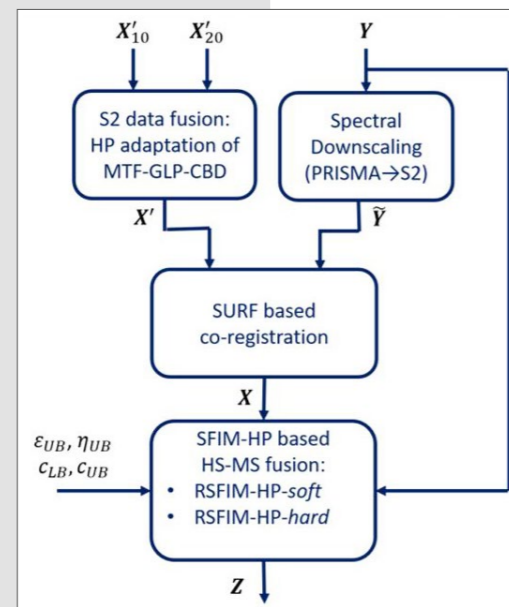
(a) Block diagram of the PRISMA-SR fusion scheme
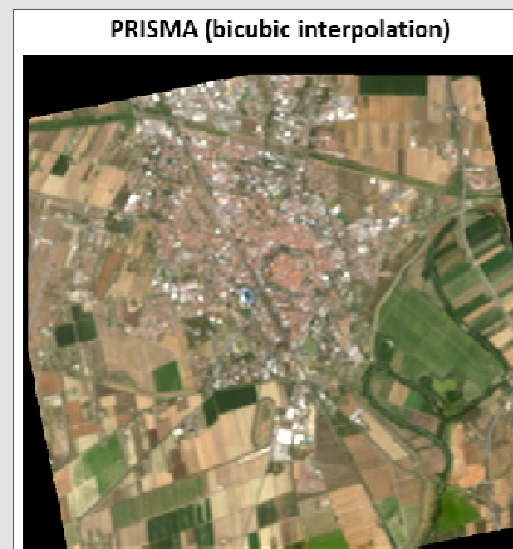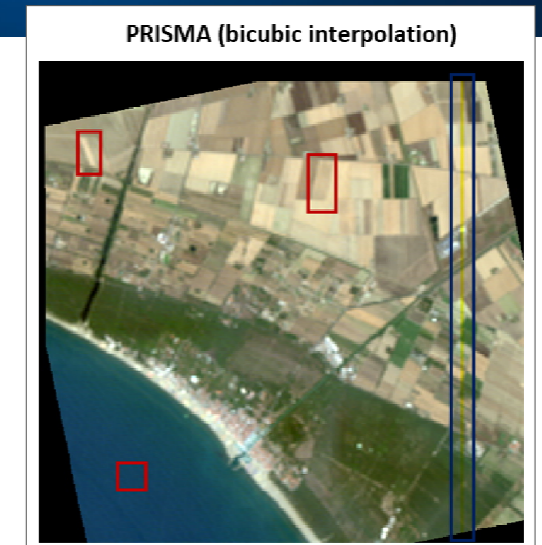

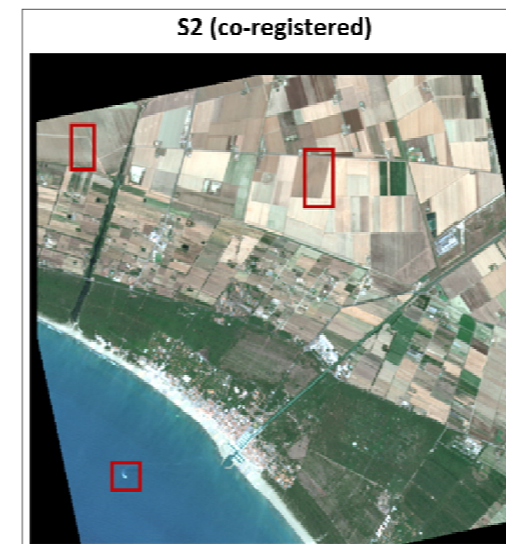(b) False Colour representation of PRISMA image

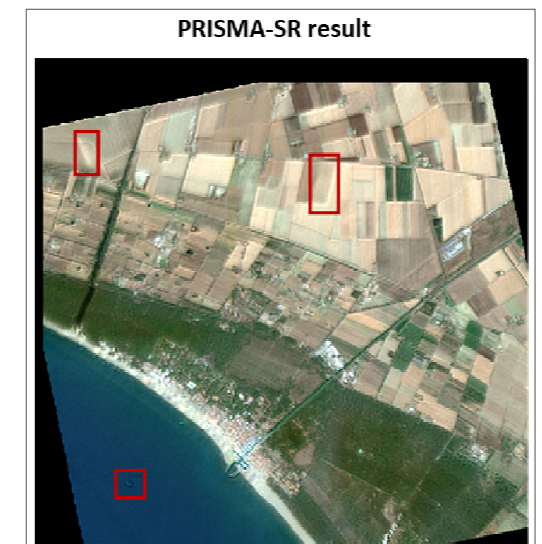(c) False Colour representation of S2 co-registered image

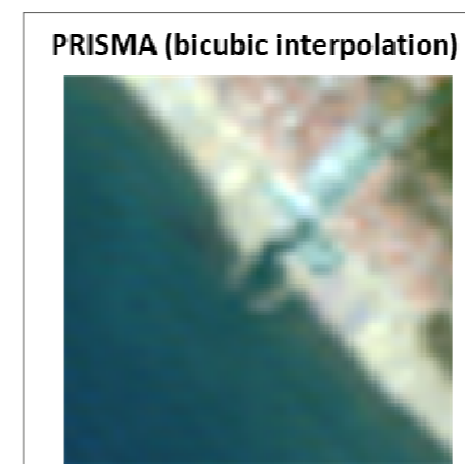(d) result of the PRISMA-SR procedure

(e) False Colour representation of PRISMA image

(f) False Colour representation of S2 co-registered image

(g) result of the PRISMA-SR procedure

(h) False Colour representation of PRISMA image

(i) False Colour representation of S2 co-registered image

(l) result of the PRISMA-SR procedure