



HAL
open science

MatP-mediated positioning of chromosome terminus regions in *V. cholerae*

Elena Espinosa, Jihane Challita, Jean-Michel Desfontaines, M.-E. Val-Kennedy, M. Marbouty, Christophe Possoz, Elisa Galli, François-xavier Barre

► To cite this version:

Elena Espinosa, Jihane Challita, Jean-Michel Desfontaines, M.-E. Val-Kennedy, M. Marbouty, et al.. MatP-mediated positioning of chromosome terminus regions in *V. cholerae*. EMBO Workshop 2023 - DNA topology and topoisomerases in genome dynamics, Sep 2023, Villars-sur-Ollon (virtual event), Switzerland. . hal-04306304

HAL Id: hal-04306304

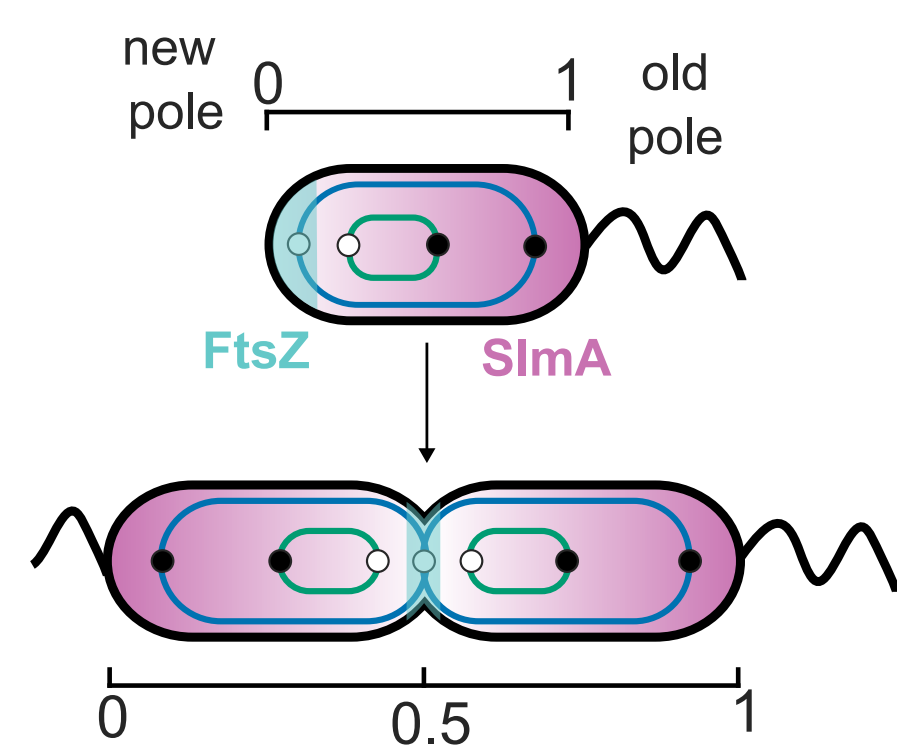
<https://hal.science/hal-04306304>

Submitted on 24 Nov 2023

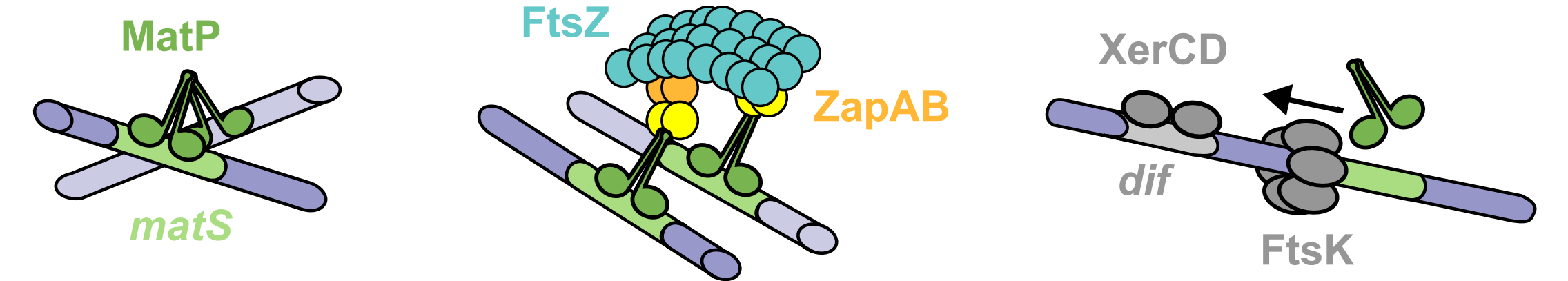
HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

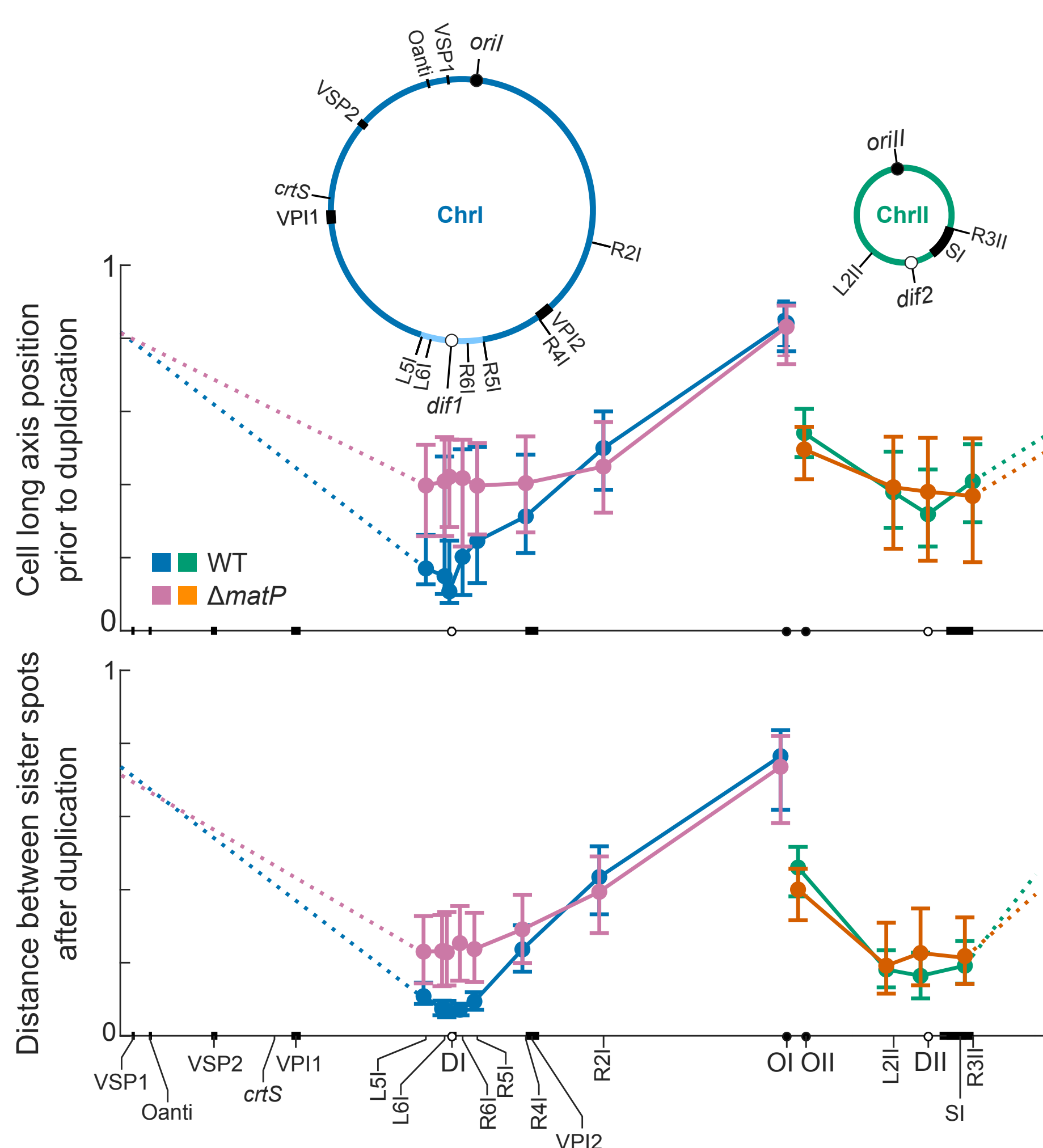
V. cholerae is a curved rod-shaped bacterium with a single polar flagellum. Its genome is distributed on two circular chromosomes, ChrI and ChrII. Each carries a single origin of replication, *oriI* and *oriII*, with replication terminating in a diametrically opposite zone, *terI* and *terII*. ChrII is derived from a megaplasmid. Its replication begins after duplication of *crtS*, a sequence located in the middle of the left replication arm of ChrI, and ends at the same time as ChrI replication. Cell division is coordinated with the replication/segregation cycle by SlmA, an inhibitor of FtsZ-ring assembly that is bound all along ChrI and ChrII but *terI* and *terII*.



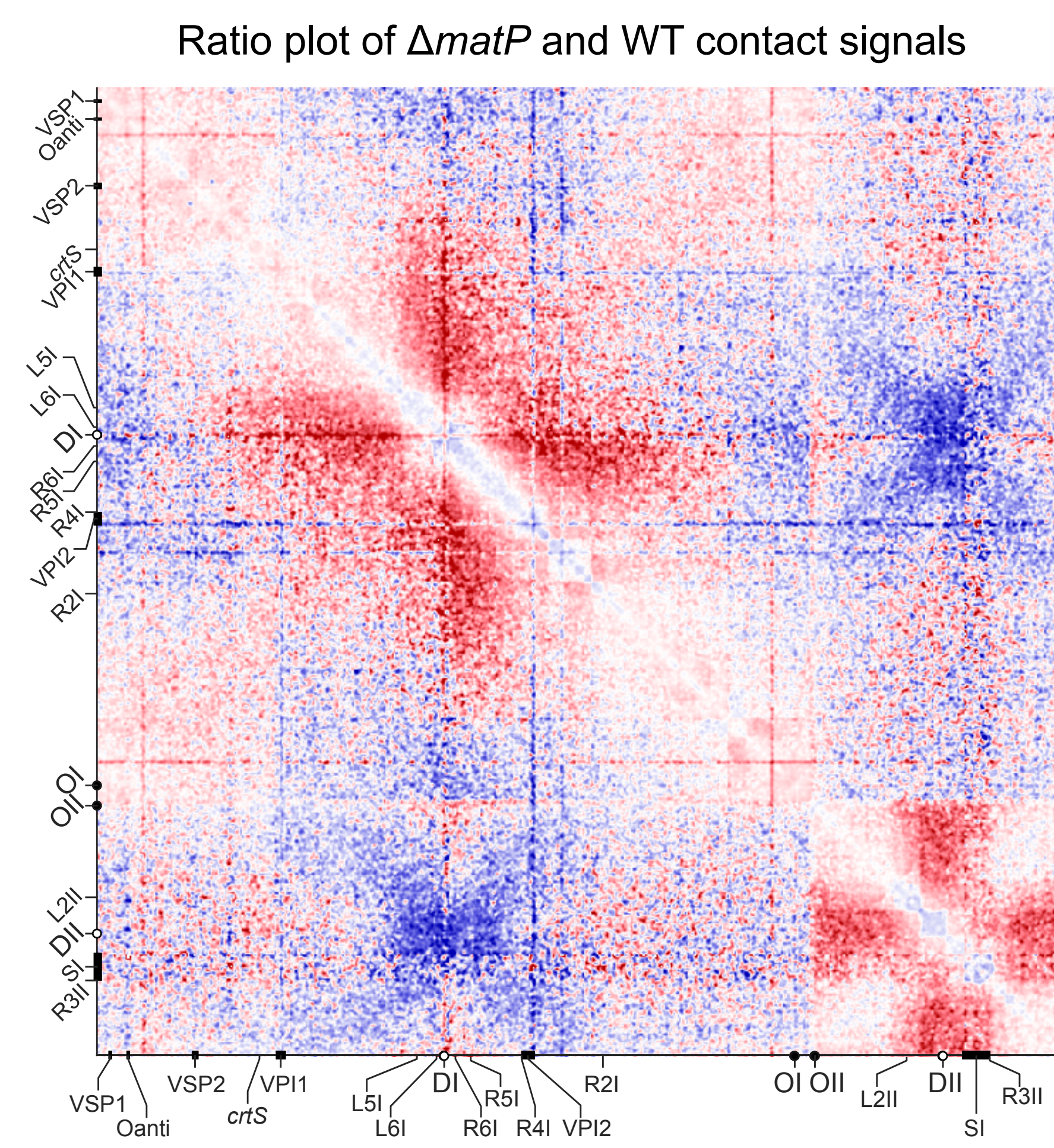
terI and *terII* positioning is key to SlmA-mediated control of cell division. ChrI encodes a homologue of the *Escherichia coli* MatP protein. *E. coli* MatP insulates the *ter* domain of the *E. coli* chromosome and dictate the positioning of sister *ter* copies at the centre of the cell by connecting them to the FtsZ-ring.



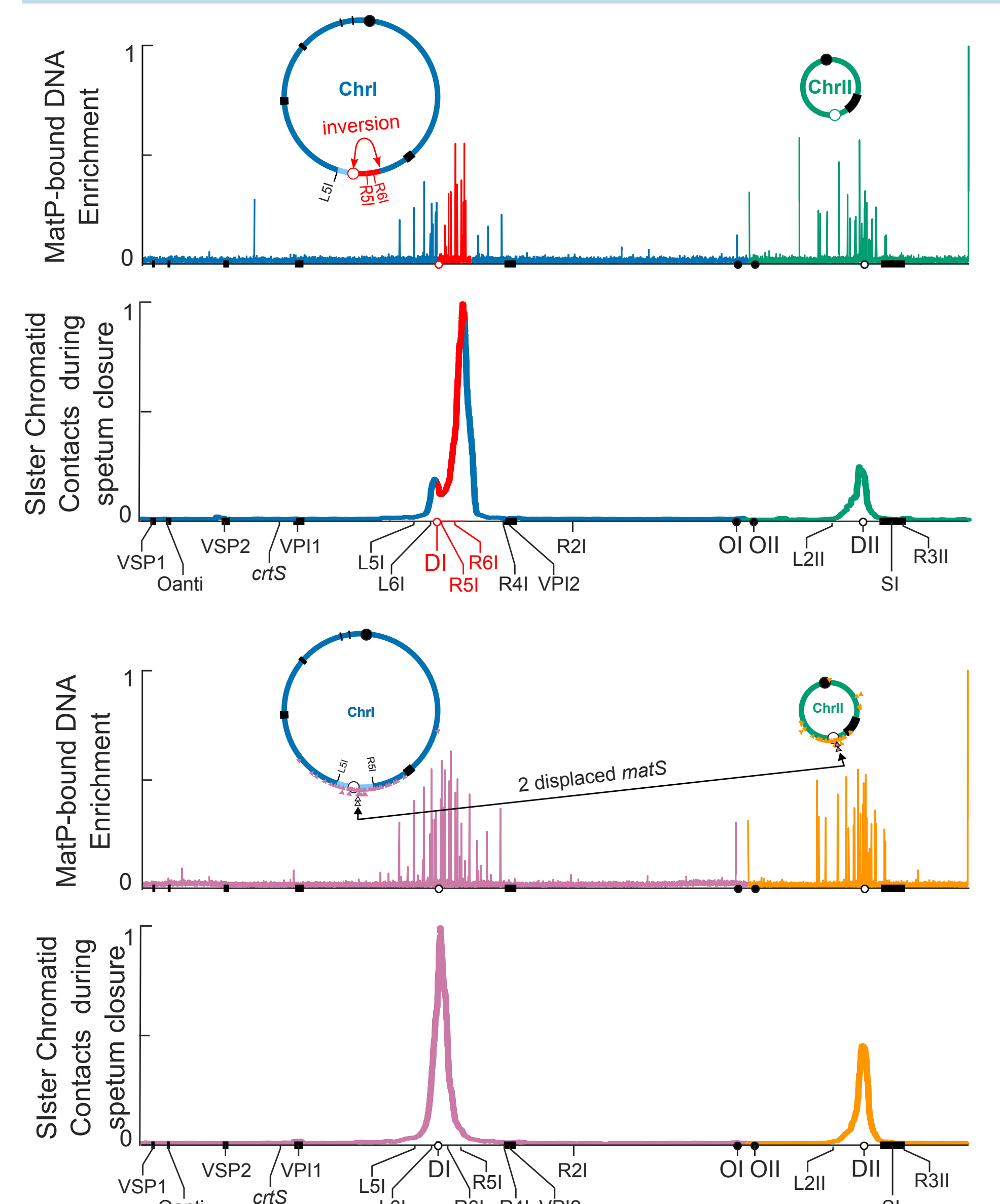
1. MatP dictates *terI* positioning



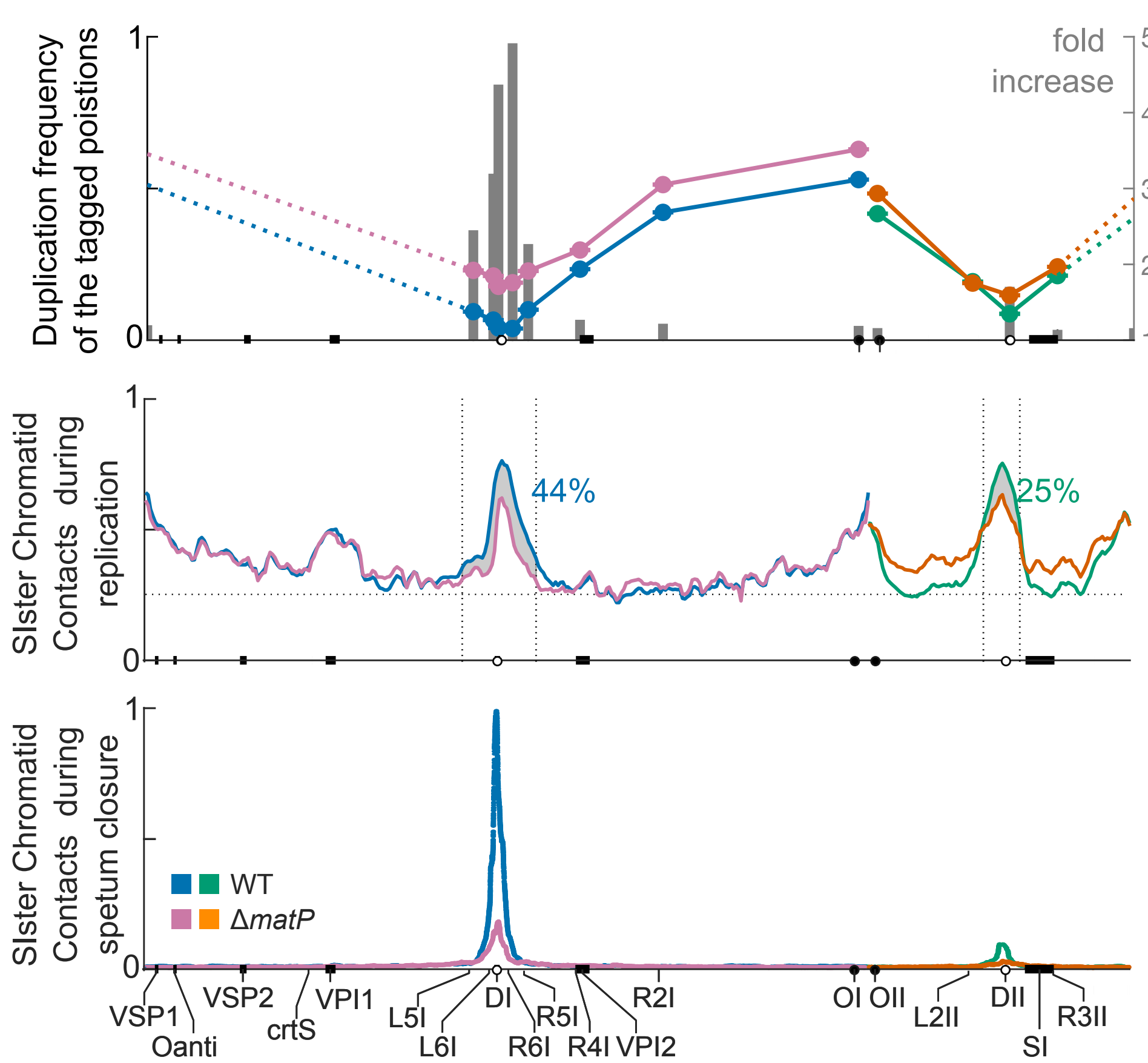
4. MatP insulates *terI* and *terII*



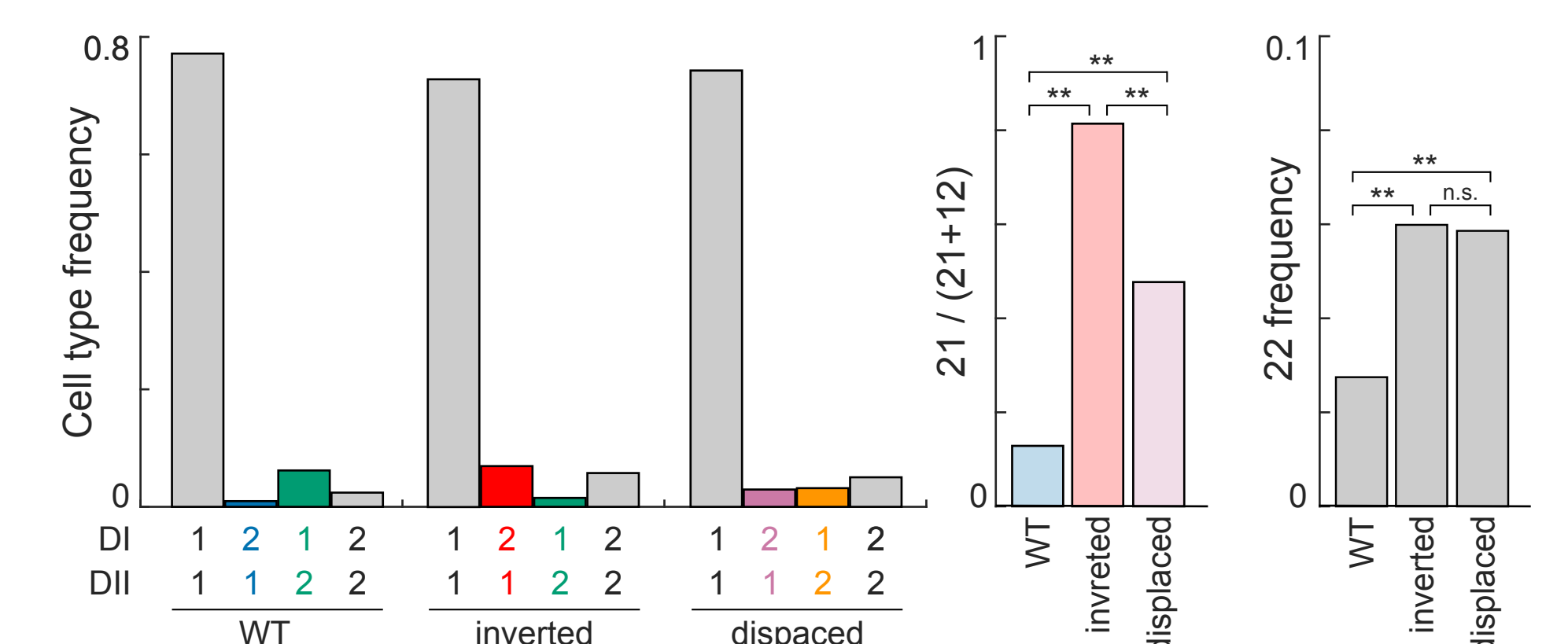
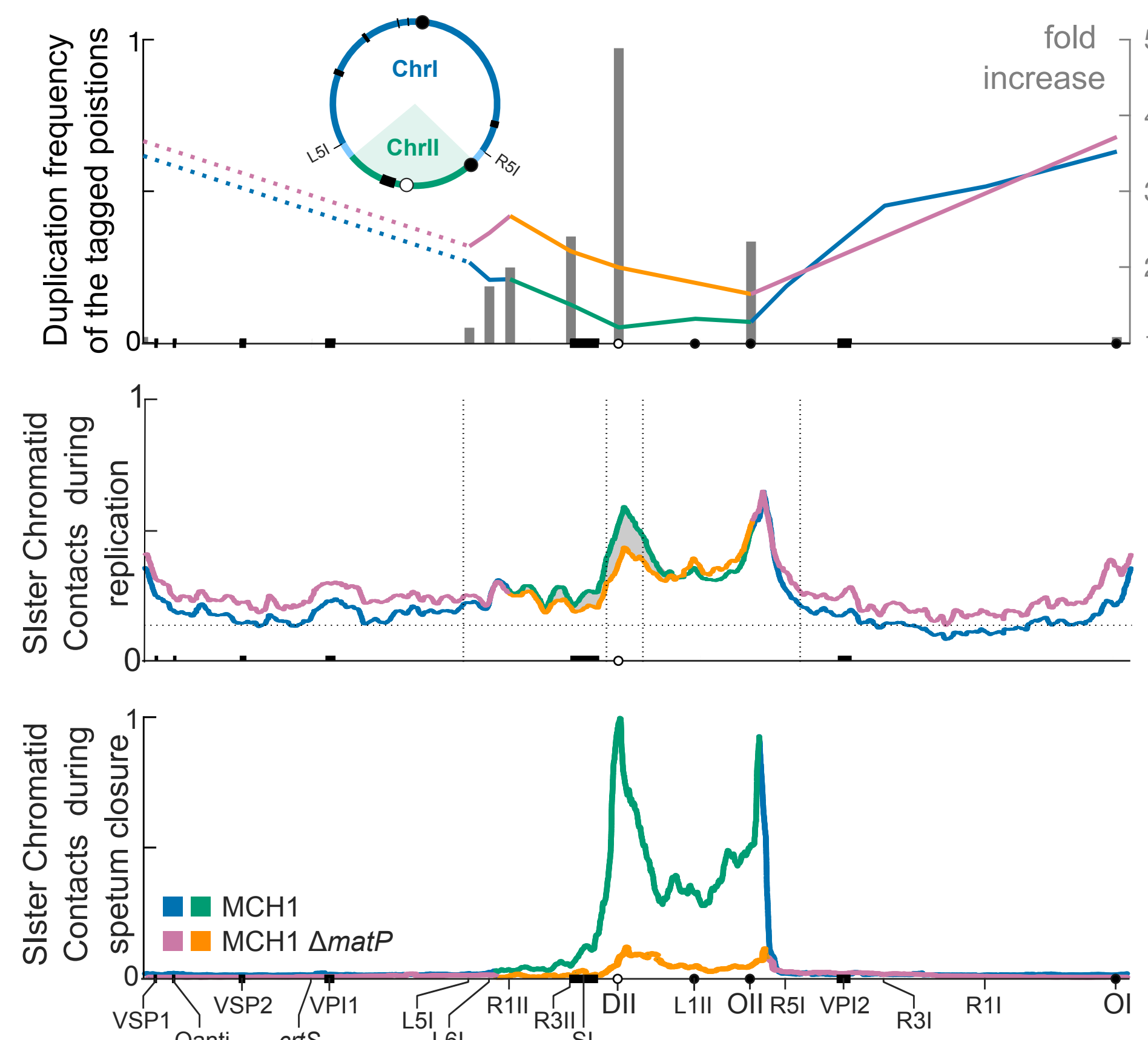
7. *matS* density increases FtsZ cohesion



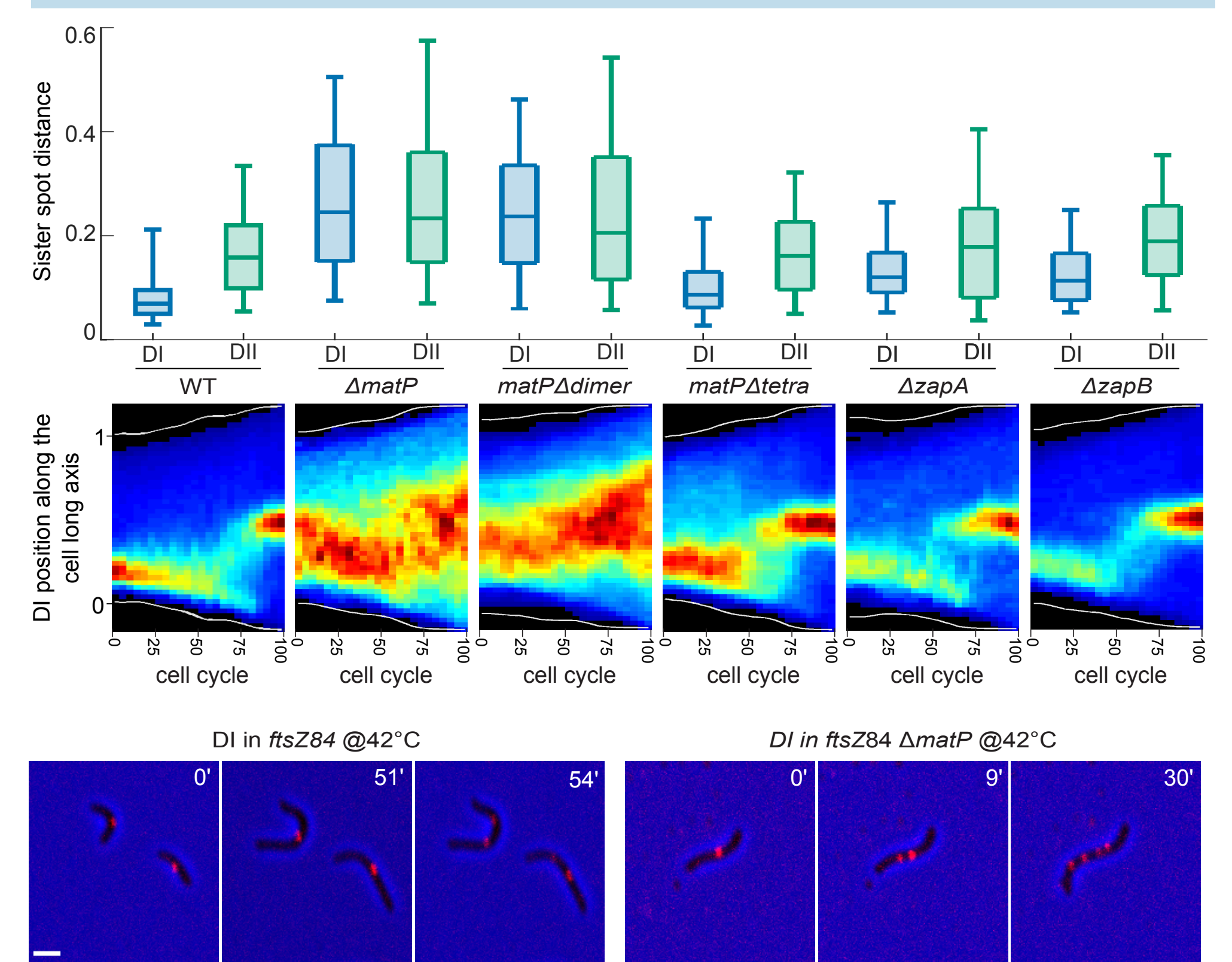
2. MatP prolongs *terI* cohesion



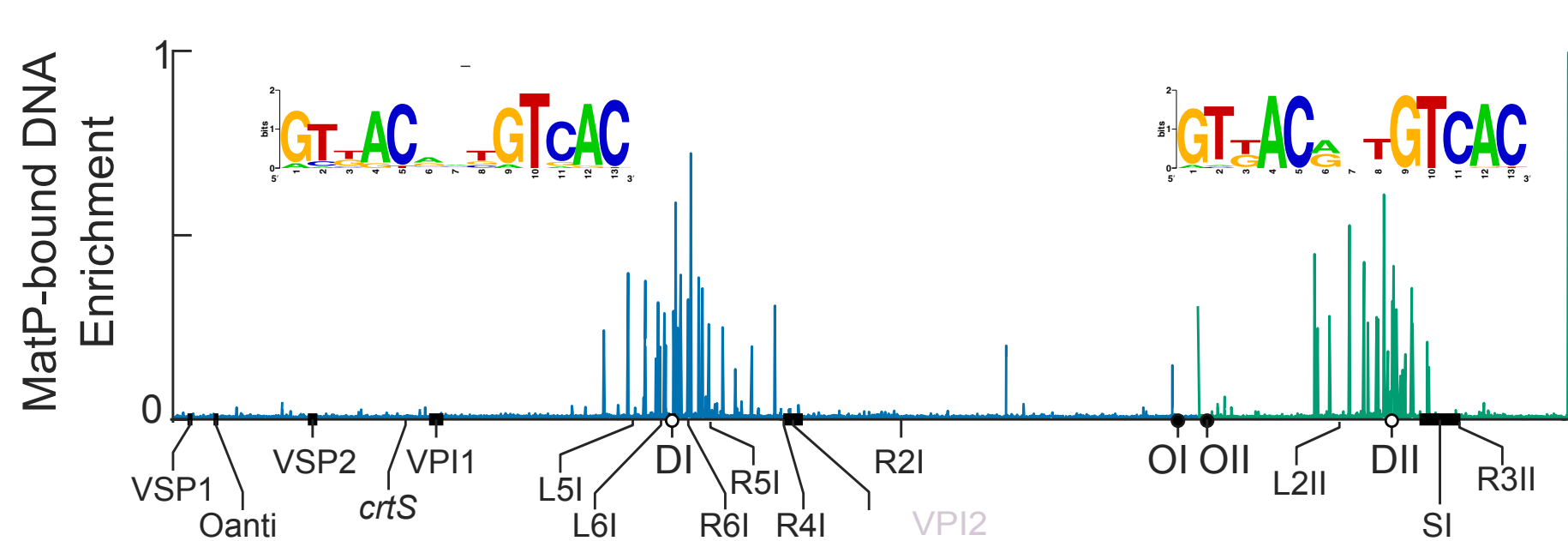
5. *terII* *matS* sites can induce cohesion



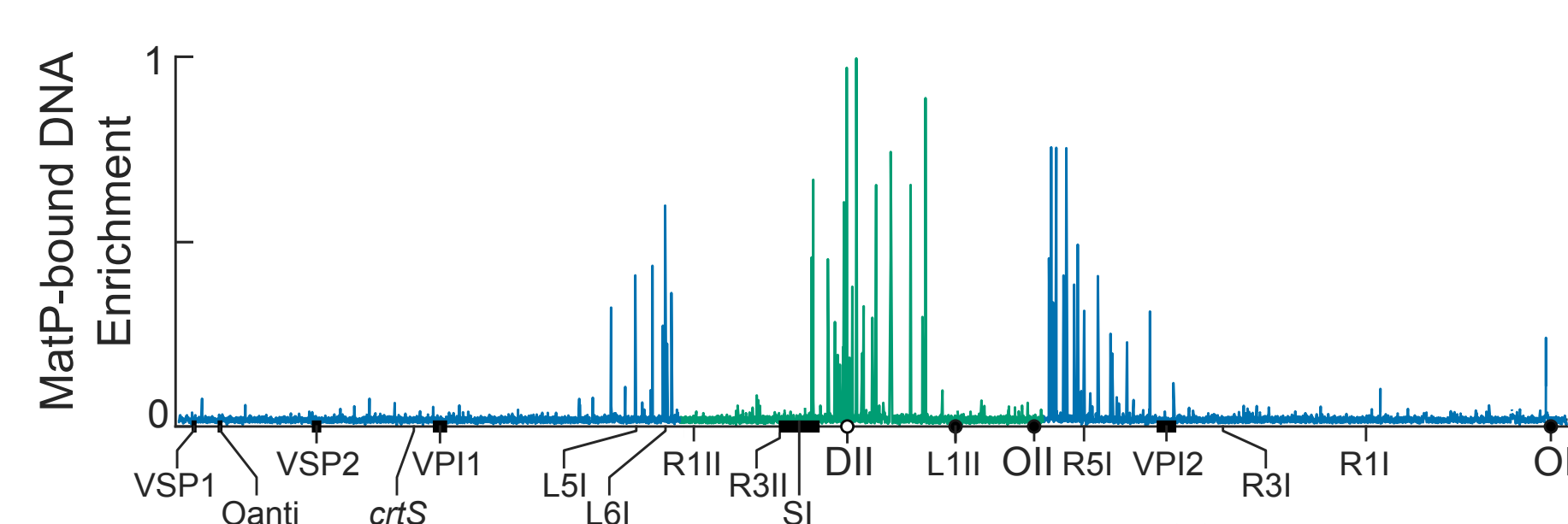
8. Cohesion is cell division independent



3. ChrII harbours *matS* sites



6. Density increases occupancy



Conclusions

- MatP ensures the polar positioning (1) and ordered segregation of *terI* loci, with *dif1* being segregated last (2), as previously observed in *E. coli*.
- *terI* and *terII* both harbour numerous *matS* sites (3) and are organised in macrodomains by MatP (4). Yet, the deletion of MatP had little effect on the positioning (1) and ordered segregation of ChrII loci (2).
- MatP binds to *matS* sites even when they are far from the replication terminus and the FtsK activity zone (3, 6, 7). Its local enrichment depends on the local density of *matS* sites (3, 6, 7), which dictates the possibility for MatP to position loci and prolong their cohesion (5 & 7).
- MatP-mediated cohesion does not depend on tetramerisation, nor any interaction with a cell division protein (8).

Perspectives

- Study the interplay between MatP, MukBEF, ParA1/*parS1* and ParA2/*parS2* in ChrI/ChrII organisation and segregation.
- Search for the factor that is responsible for the MatP-independent cohesion of sister copies of *terI* and *terII* loci behind replication forks.