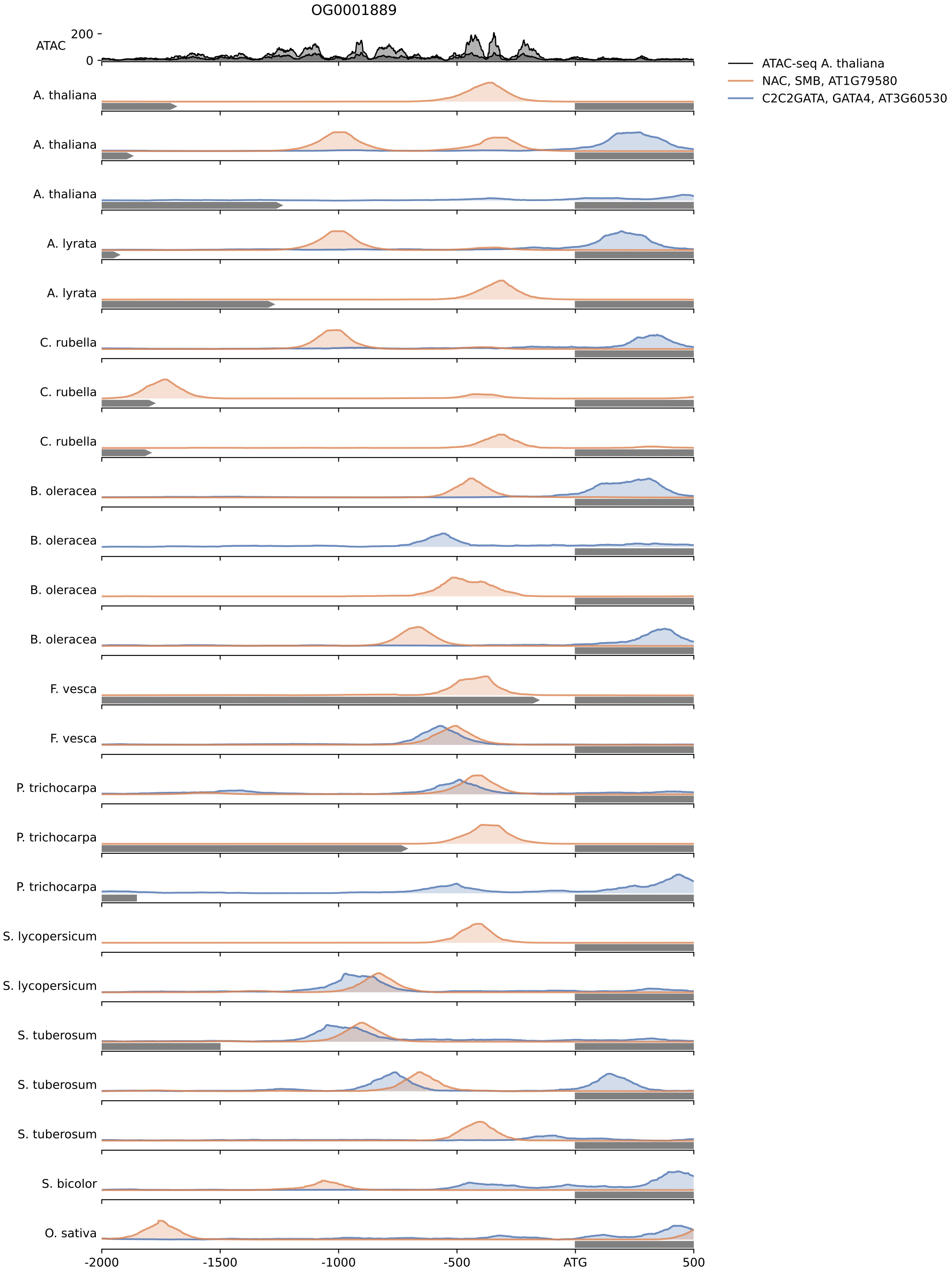
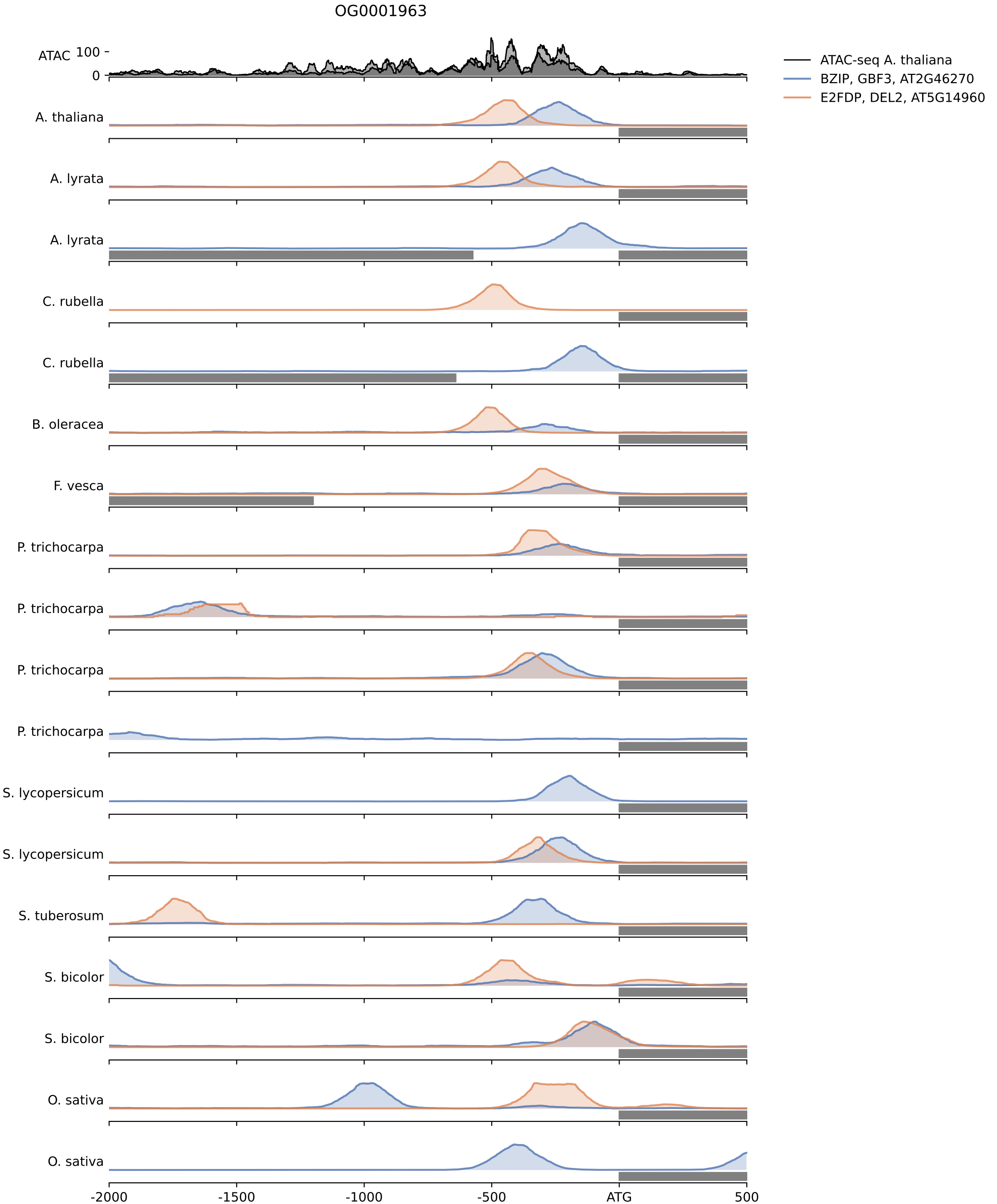


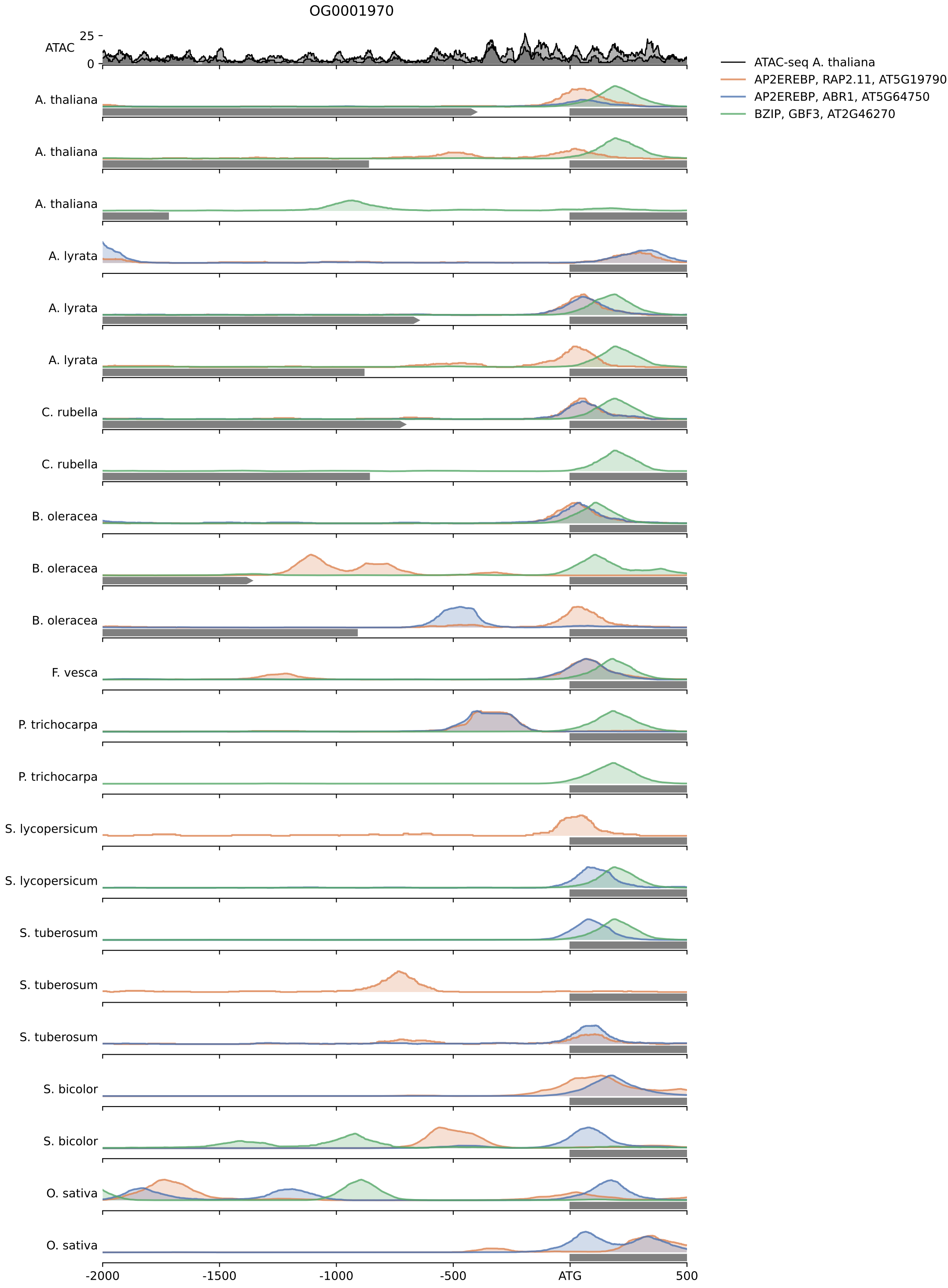
A. thaliana target: AT3G46440, UXS5, Encodes a cytosolic isoform of UDP-glucuronic acid decarboxylase. UDP-glucuronic acid decarboxylase produces UDP-xylose, which is a substrate for many cell wall carbohydrates including hemicellulose and pectin. UDP-xylose is also known to feedback regulate several cell wall biosynthetic enzymes.

A. thaliana target: AT5G59290, UXS3, Encodes a cytosolic isoform of UDP-glucuronic acid decarboxylase. This enzyme produces UDP-xylose, which is a substrate for many cell wall carbohydrates including hemicellulose and pectin. UDP-xylose is also known to feedback regulate several cell wall biosynthetic enzymes.

A. thaliana target: AT2G28760, UXS6, Encodes a cytosolic isoform of UDP-glucuronic acid decarboxylase.



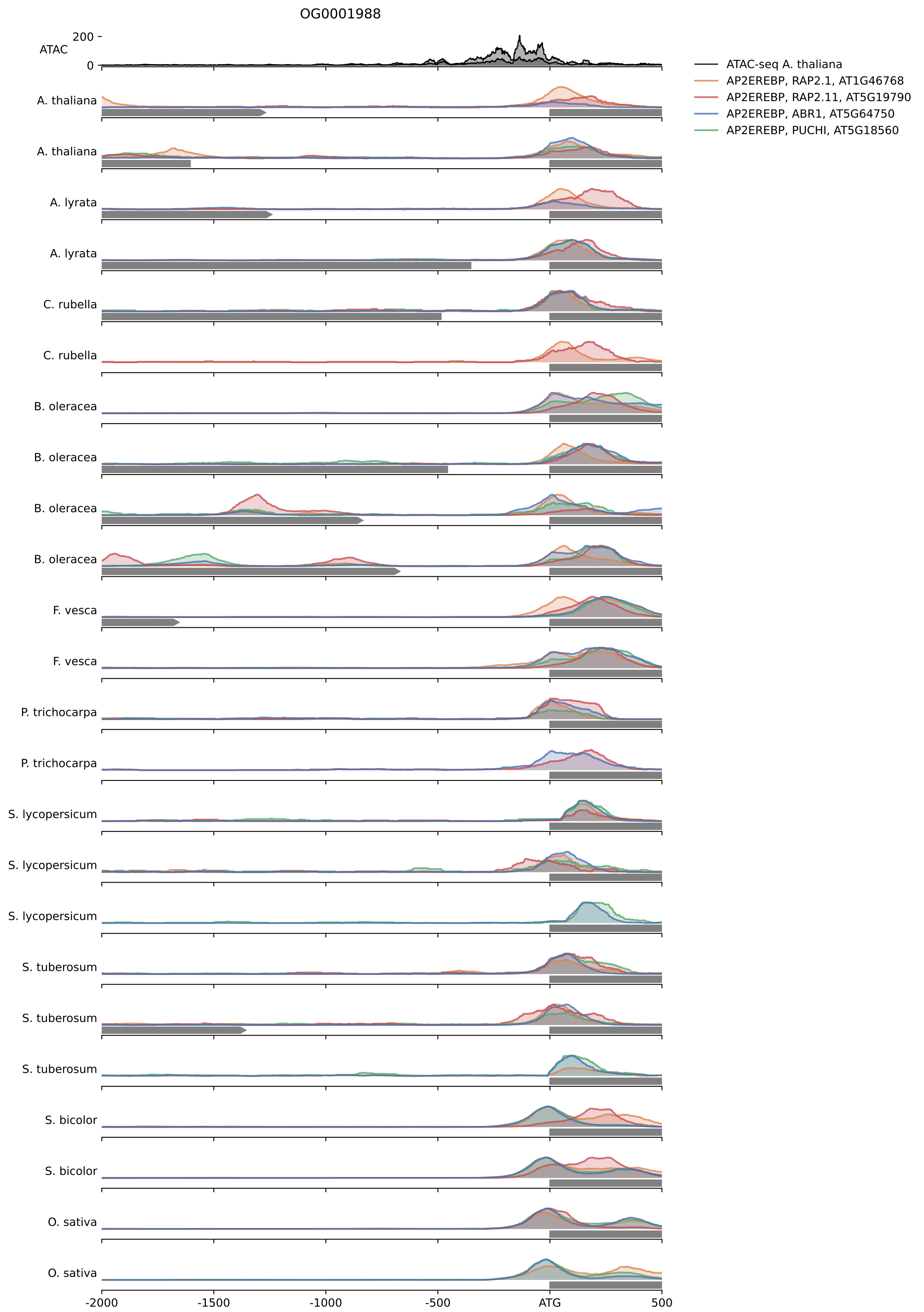
A. thaliana target: AT5G02220, SIAMESE-RELATED (SMR) family gene; activated by SMOS1/SCL28 heterodimer thus inhibiting cell cycle progression at G2 and promoting the onset of endoreplication.



A. thaliana target: AT5G07720, XXT3, Galactosyl transferase GMA12/MNN10 family protein;(source:Araport11)

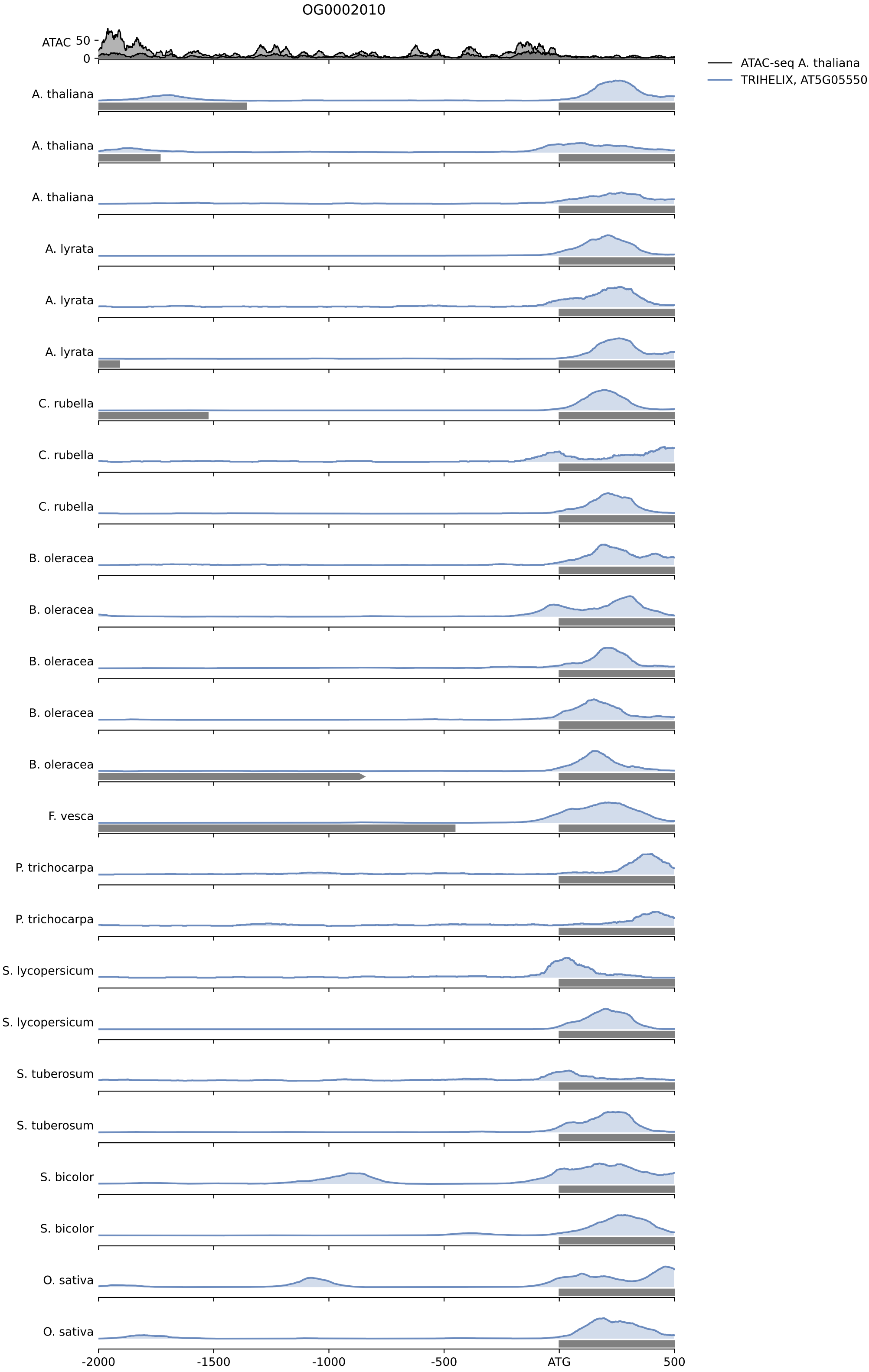
A. thaliana target: AT1G74380, XXT5, Golgi localized xyloglucan alpha-1,6-xylosyltransferase.

A. thaliana target: AT1G18690, XXT4, Galactosyl transferase GMA12/MNN10 family protein;(source:Araport11)



A. thaliana target: AT5G02870, Ribosomal protein L4/L1 family;(source:Araport11)

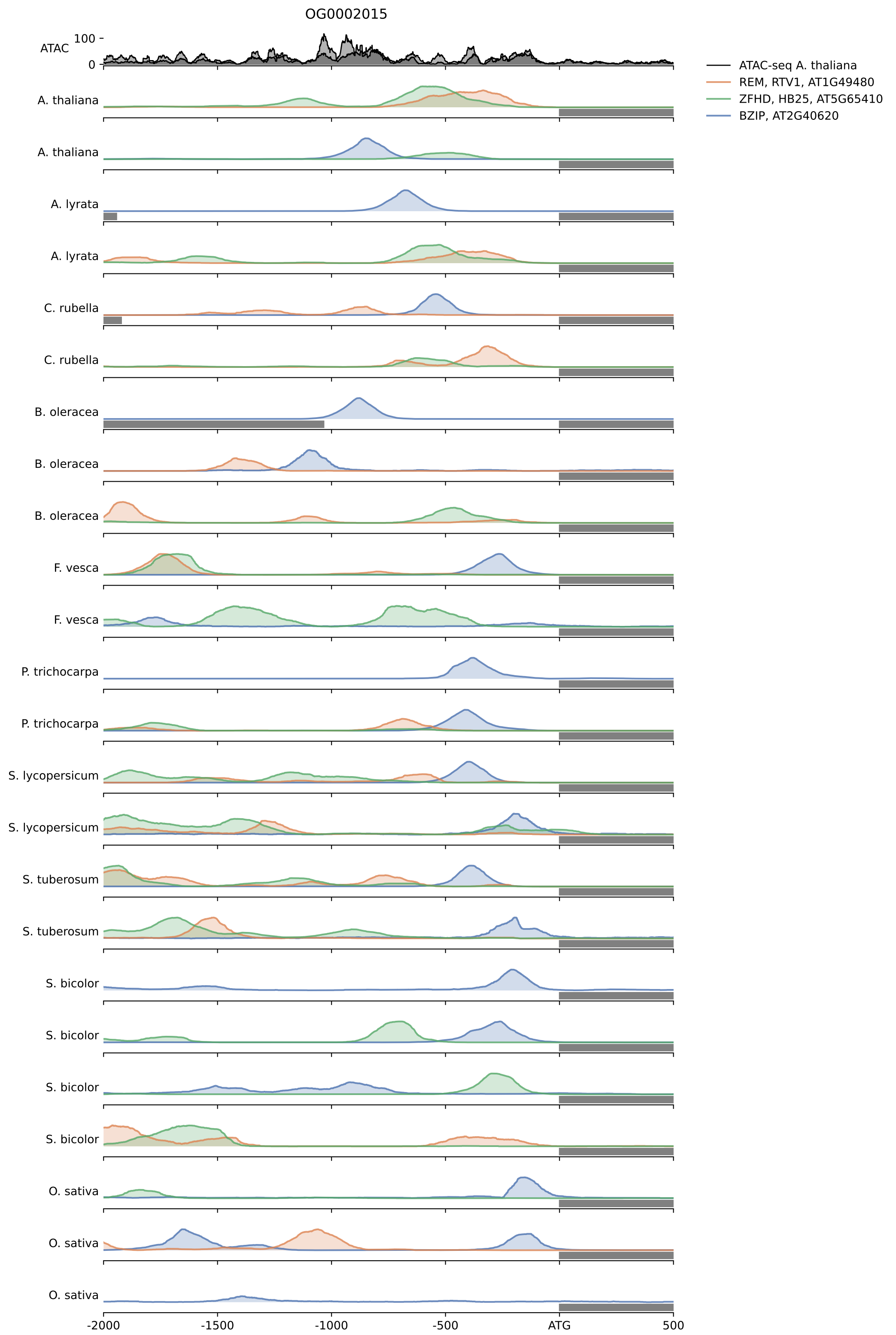
A. thaliana target: AT3G09630, Ribosomal protein L4/L1 family;(source:Araport11)



A. thaliana target: AT3G12970, serine/arginine repetitive matrix-like protein;(source:Araport11)

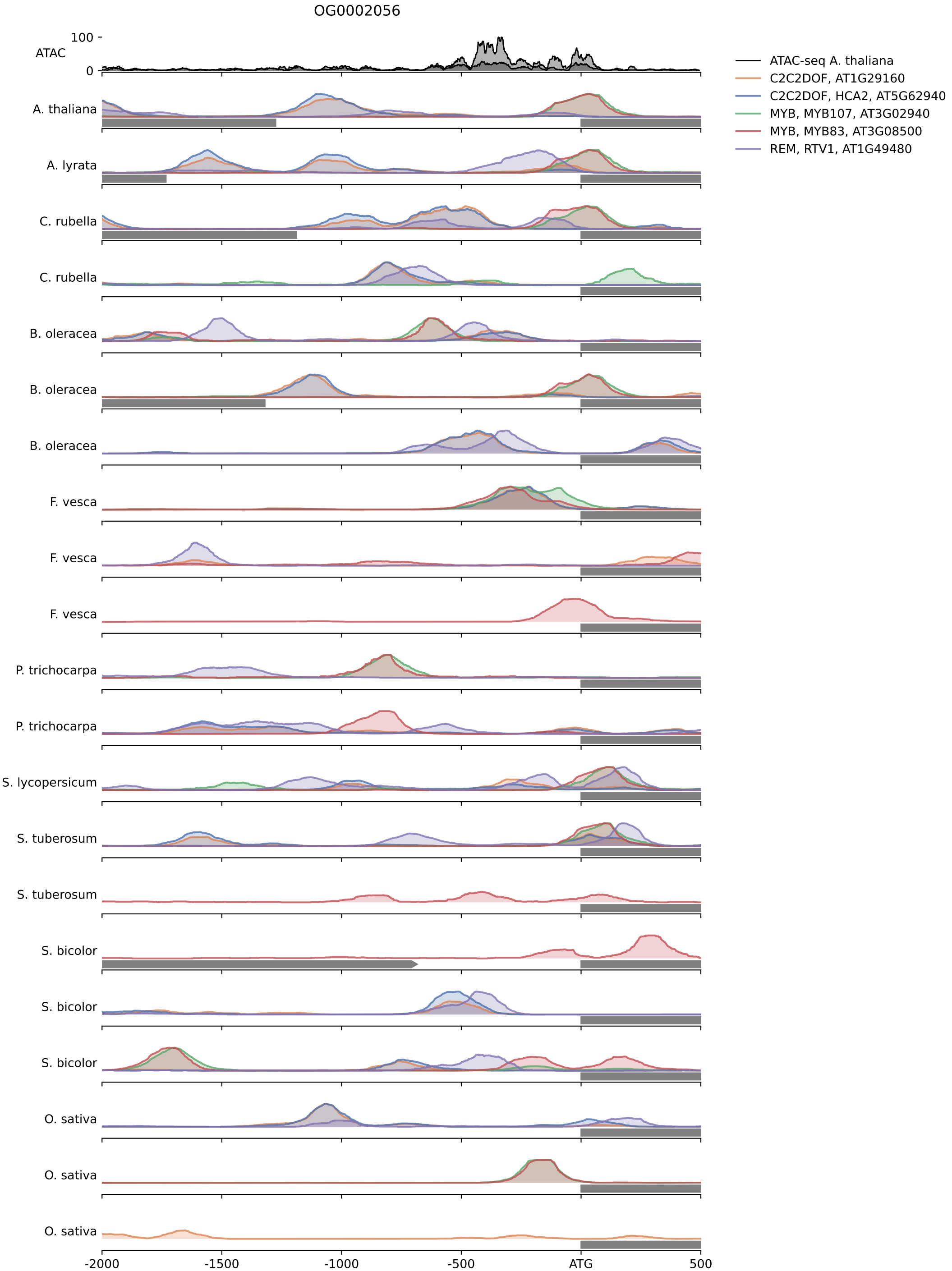
A. thaliana target: AT1G79060, TPRXL;(source:Araport11)

A. thaliana target: AT1G56020, serine/arginine repetitive matrix-like protein;(source:Araport11)

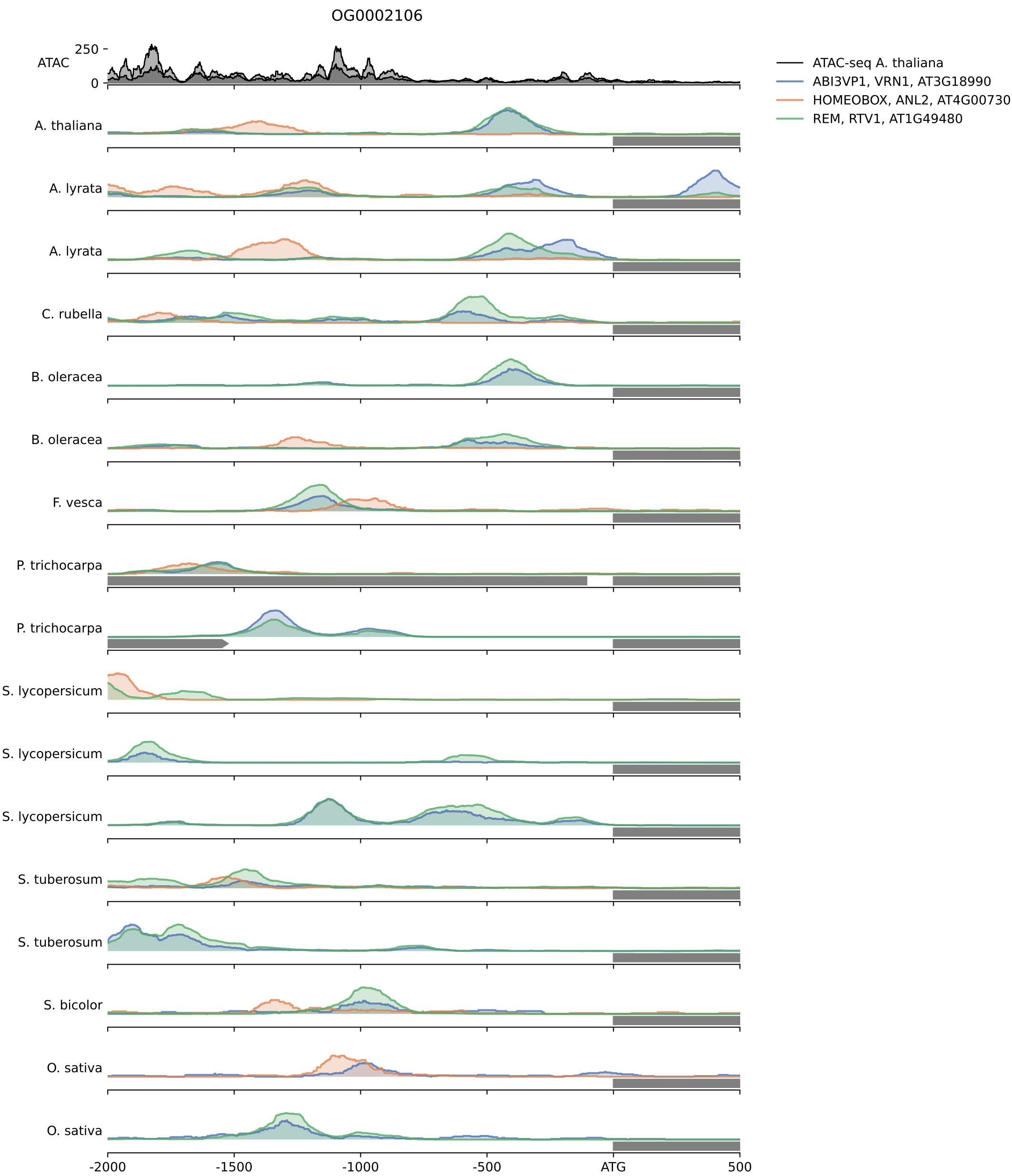


A. thaliana target: AT4G29310, DUF1005 family protein (DUF1005);(source:Araport11)

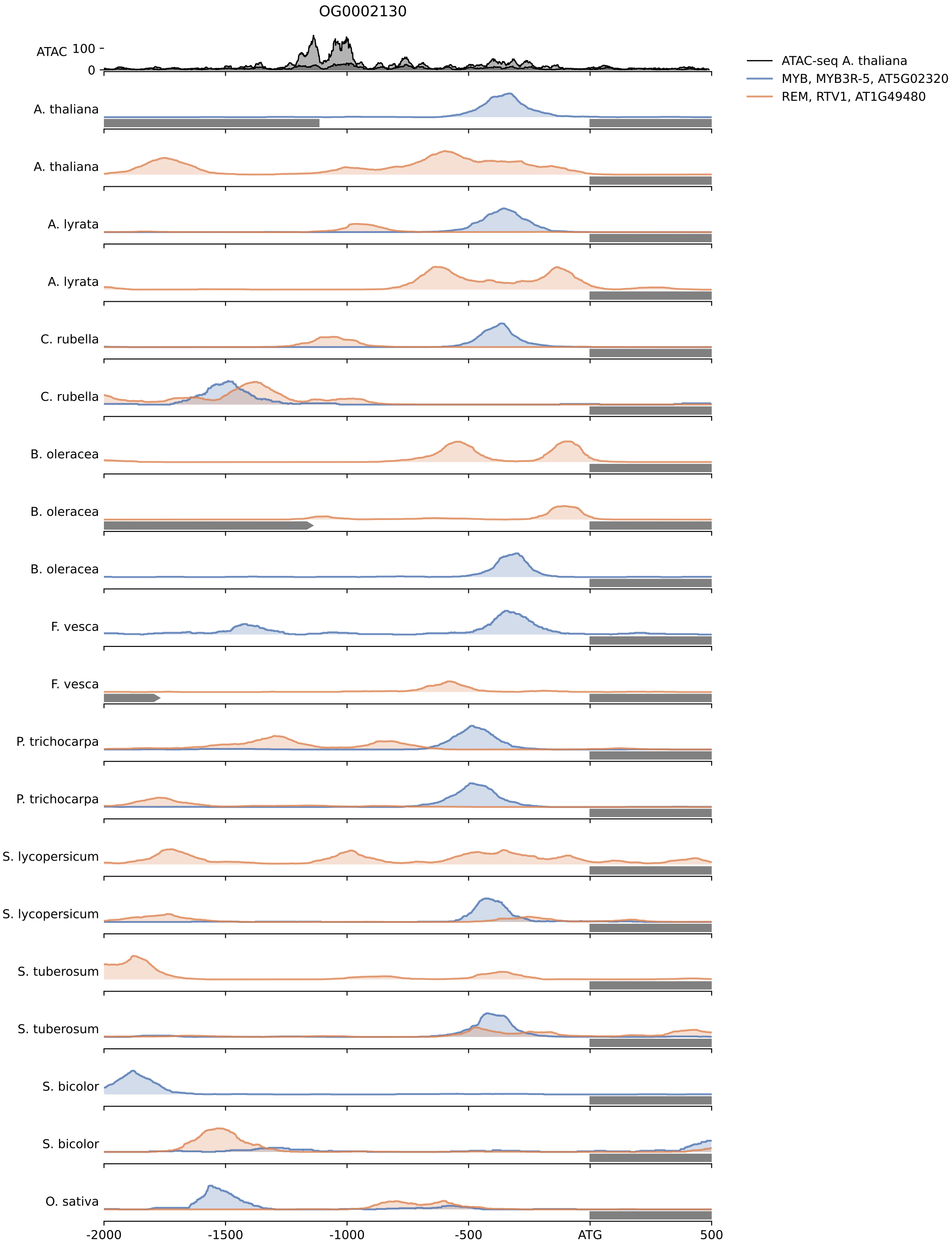
A. thaliana target: AT1G10020, formin-like protein (DUF1005);(source:Araport11)



A. thaliana target: AT3G06350, MEE32, Encodes a bi-functional dehydroquinate-shikimate dehydrogenase enzyme that catalyzes two steps in the chorismate biosynthesis pathway.

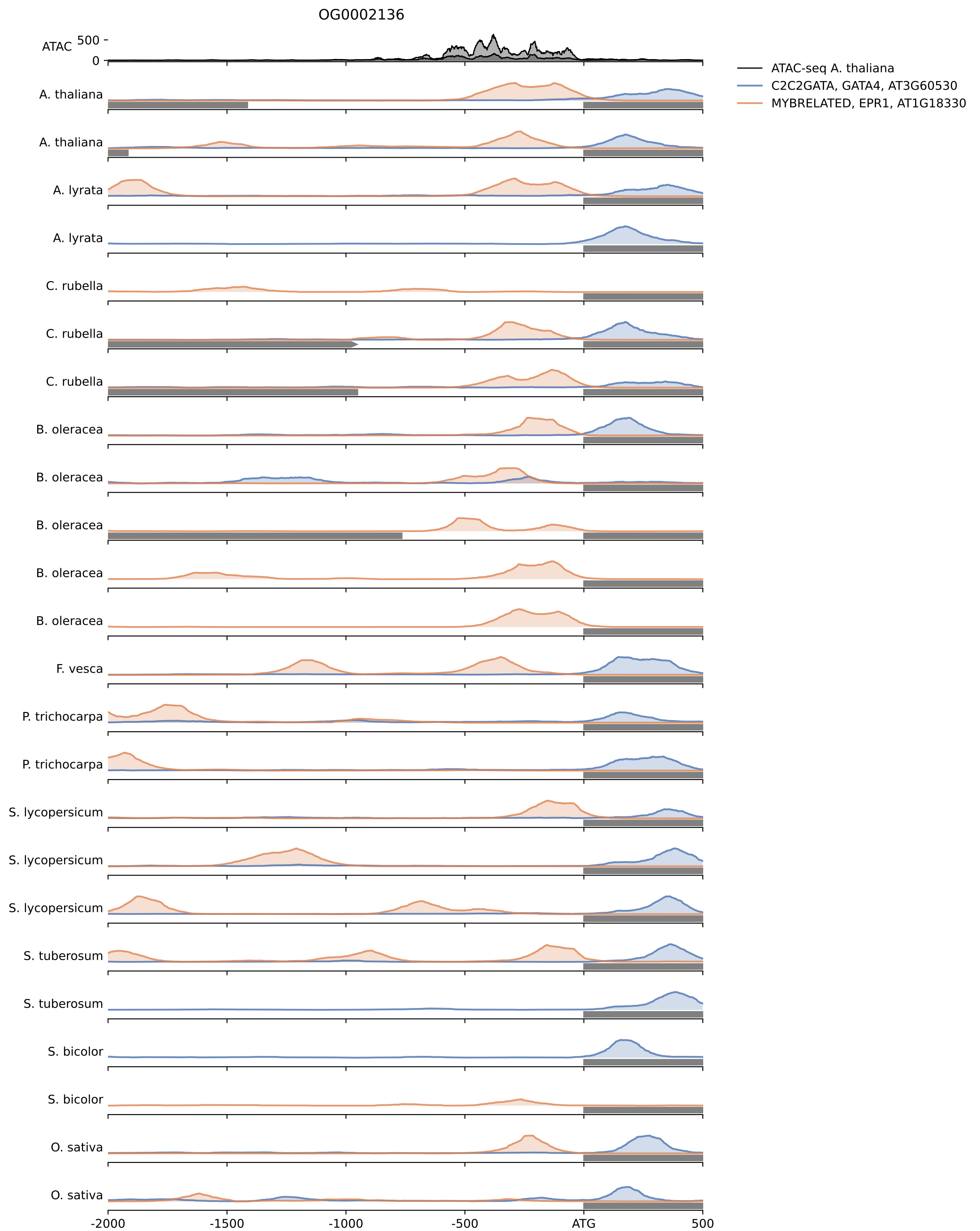


A. thaliana target: AT3G51950, Contains single CCCH domain.



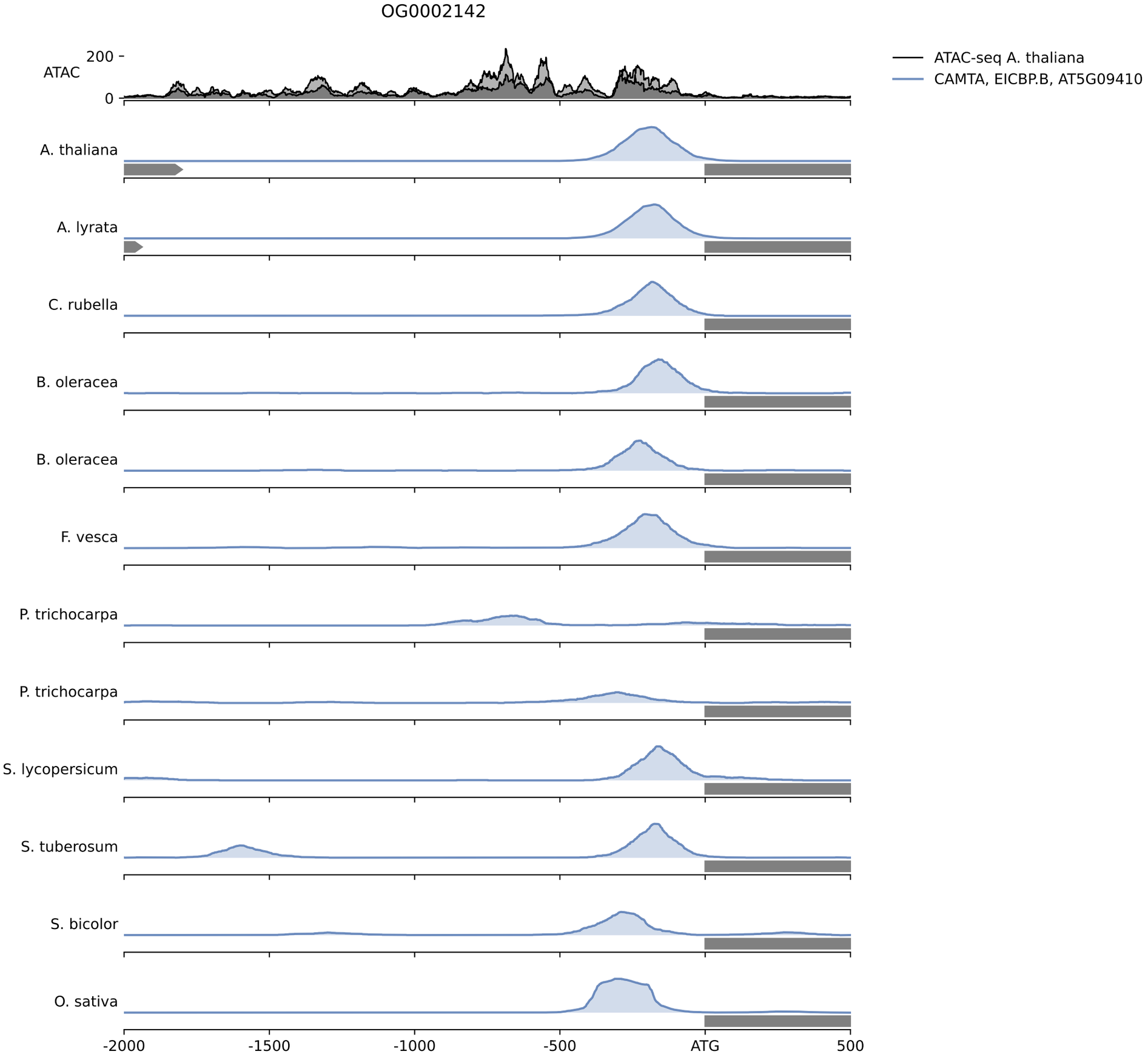
A. thaliana target: AT2G34190, Xanthine/uracil permease family protein;(source:Araport11)

A. thaliana target: AT2G05760, Xanthine/uracil permease family protein;(source:Araport11)

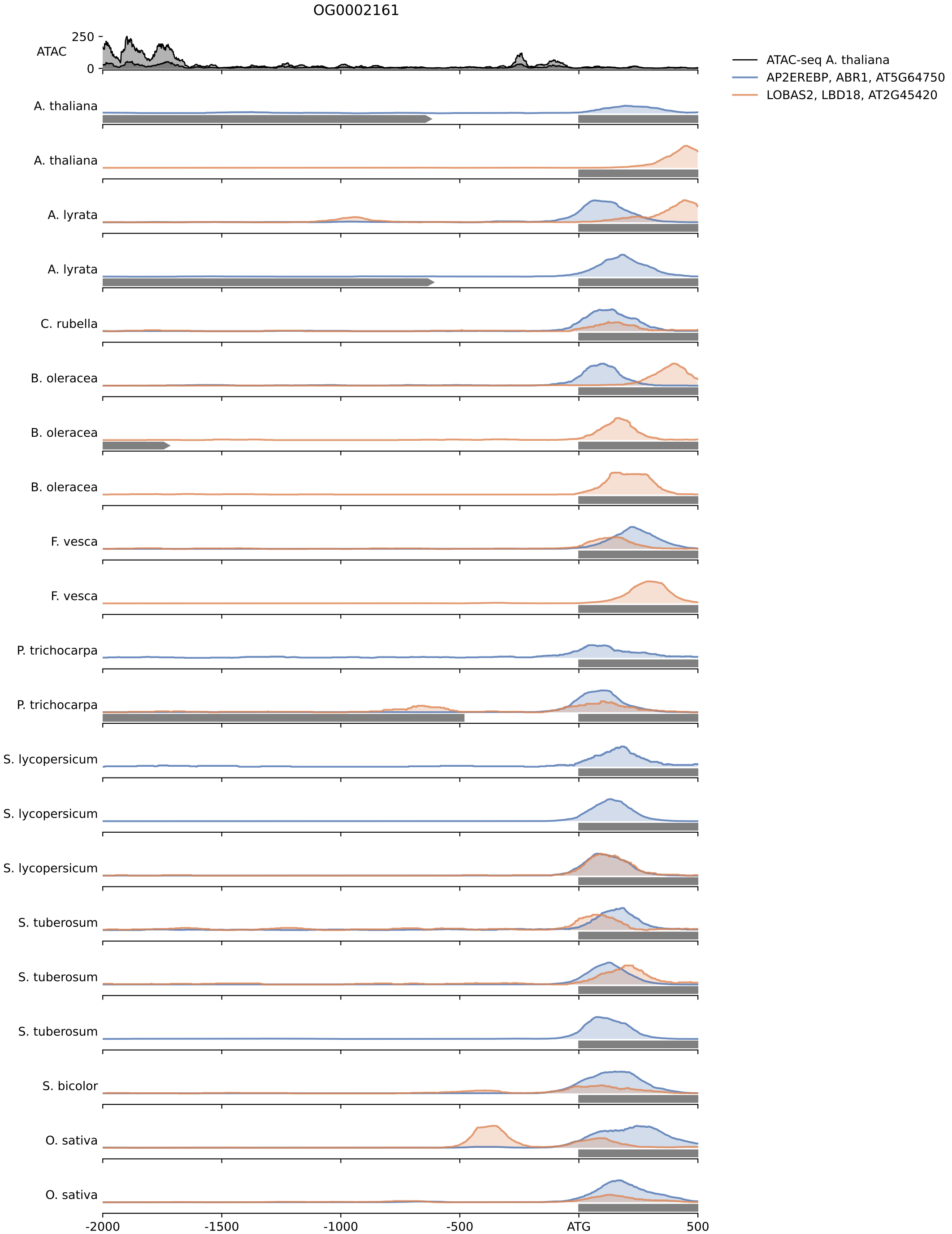


A. thaliana target: AT2G21660, GRP7, Encodes a small glycine-rich RNA binding protein that is part of a negative-feedback loop through which AtGRP7 regulates the circadian oscillations of its own transcript. Gene expression is induced by cold. GRP7 appears to promote stomatal opening and reduce tolerance under salt and dehydration stress conditions, but, promotes stomatal closing and thereby increases stress tolerance under conditions of cold tolerance. Loss of function mutations have increased susceptibility to pathogens suggesting a role in mediating innate immune response. Mutants are also late flowering in a non-photoperiodic manner and are responsive to vernalization suggesting an interaction with the autonomous flowering pathway. There is a reduction of mRNA export from the nucleus in grp7 mutants. GRP7:GFP fusion proteins can be found in the cytosol and nucleus. A substrate of the type III effector HopU1 (mono-ADP-ribosyltransferase).

A. thaliana target: AT4G39260, CCR1, Encodes a glycine-rich protein with RNA binding domain at the N-terminus. Protein is structurally similar to proteins induced by stress in other plants. Gene expression is induced by cold. Transcript undergoes circadian oscillations that is depressed by overexpression of AtGRP7. A substrate of the type III effector HopU1 (mono-ADP-ribosyltransferase).

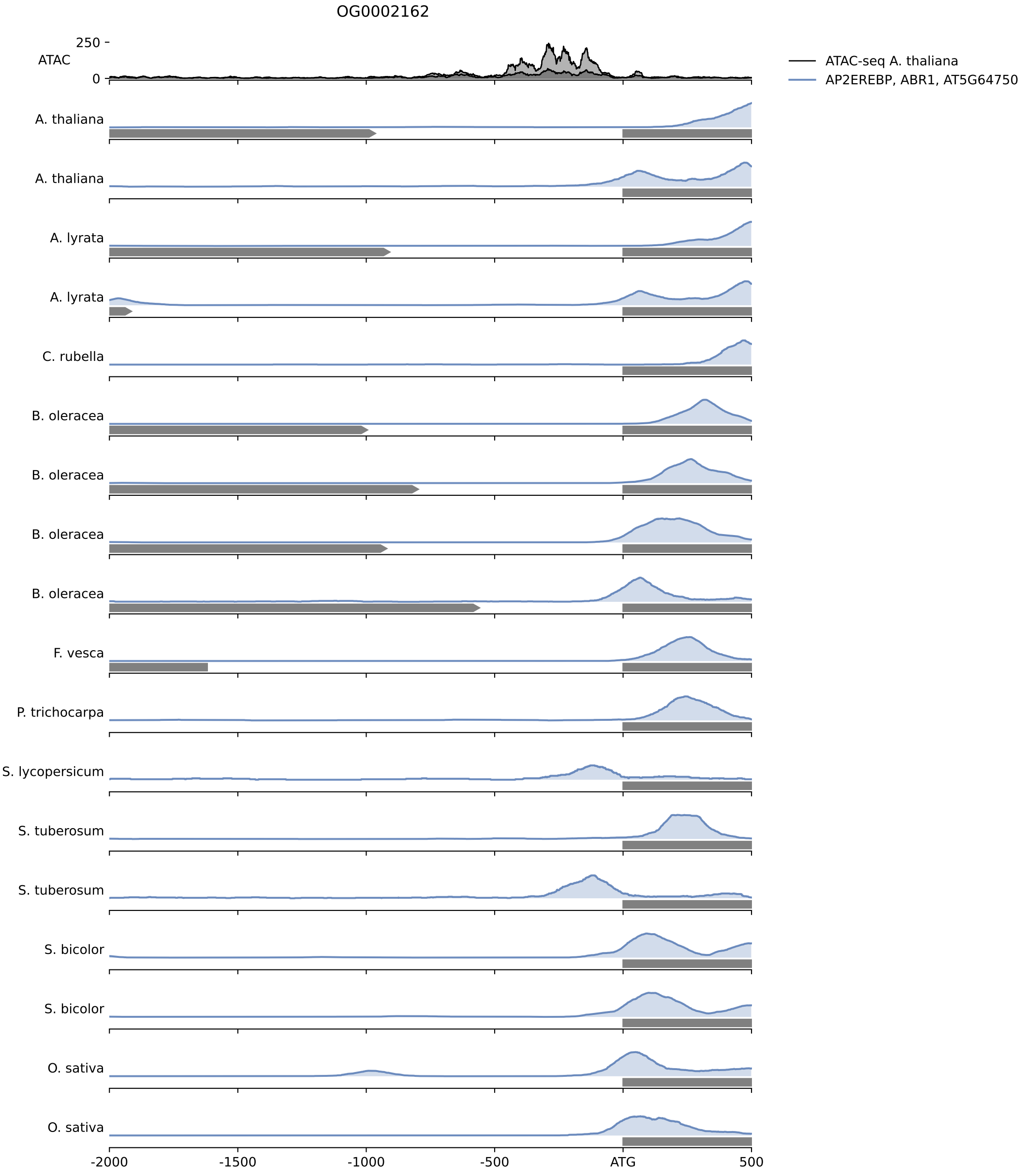


A. thaliana target: AT3G05500, Encodes a protein that associates with lipid droplet surfaces and shares sequence homology with family of small rubber particle proteins. The mRNA is cell-to-cell mobile.



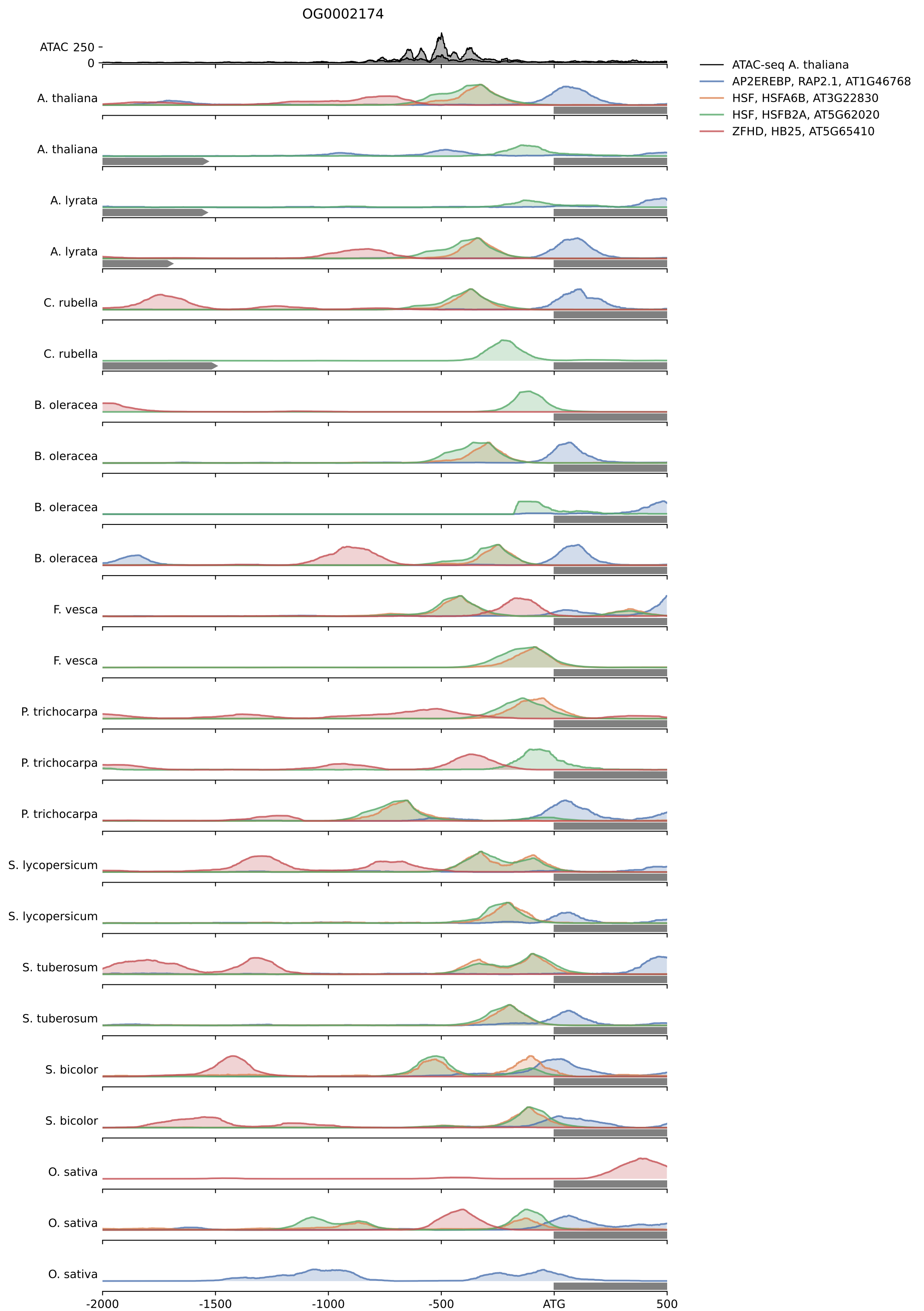
A. thaliana target: AT5G03200, LUL1, Paralog of LOG2 (At3g09770), a ubiquitin ligase that regulates amino acid export.

A. thaliana target: AT3G09770, LOG2, Encodes a ubiquitin E3 ligase LOG2 (LOSS OF GDU2). Required for GLUTAMINE DUMPER1(GDU1)-induced amino secretion.



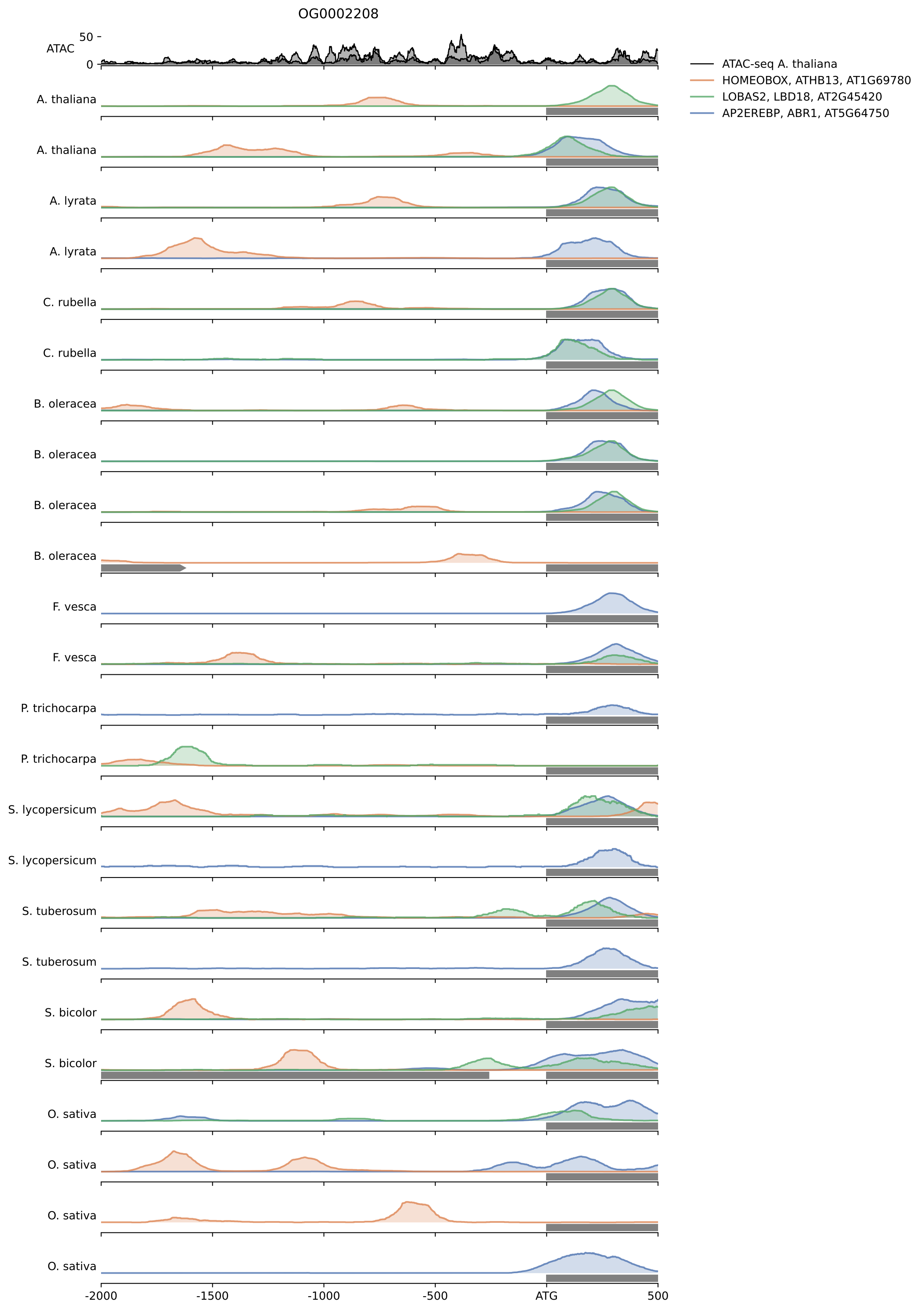
A. thaliana target: AT3G04930, DNA-binding storekeeper protein-related transcriptional regulator;(source:Araport11)

A. thaliana target: AT5G28040, Member of the GeBP/GPL family of leucine zipper transcription factors. VPF4 interacts with the F-box proteins from A.tumefaciens VirF and VBF. Over expression results in decreased tumor formation upon Agrobacterium infection. Mutants show changes in the level of expression of defense response genes.



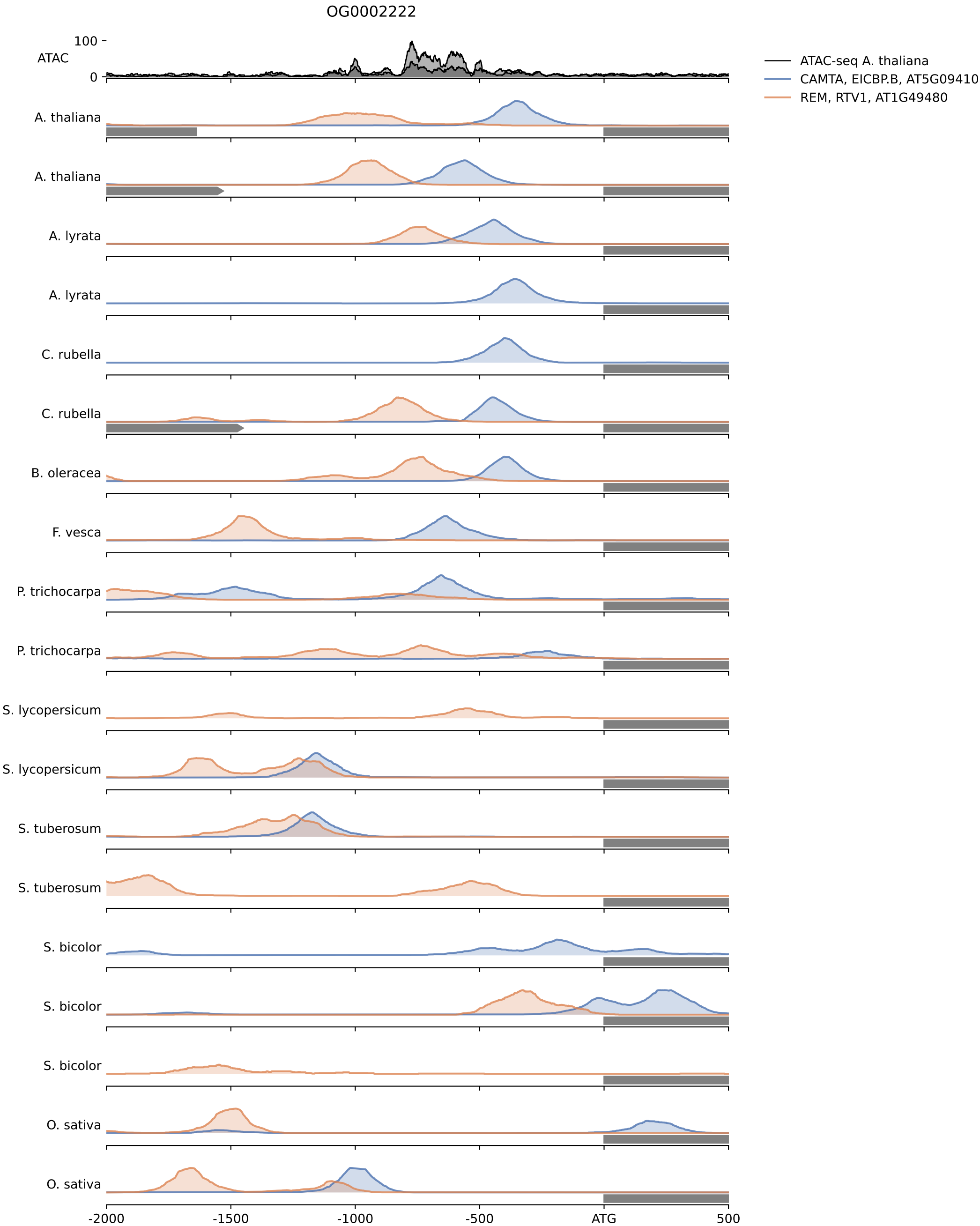
A. thaliana target: AT4G11660, AT-HSFB2B, member of Heat Stress Transcription Factor (Hsf) family

A. thaliana target: AT5G62020, HSFB2A, member of Heat Stress Transcription Factor (Hsf) family The mRNA is cell-to-cell mobile.



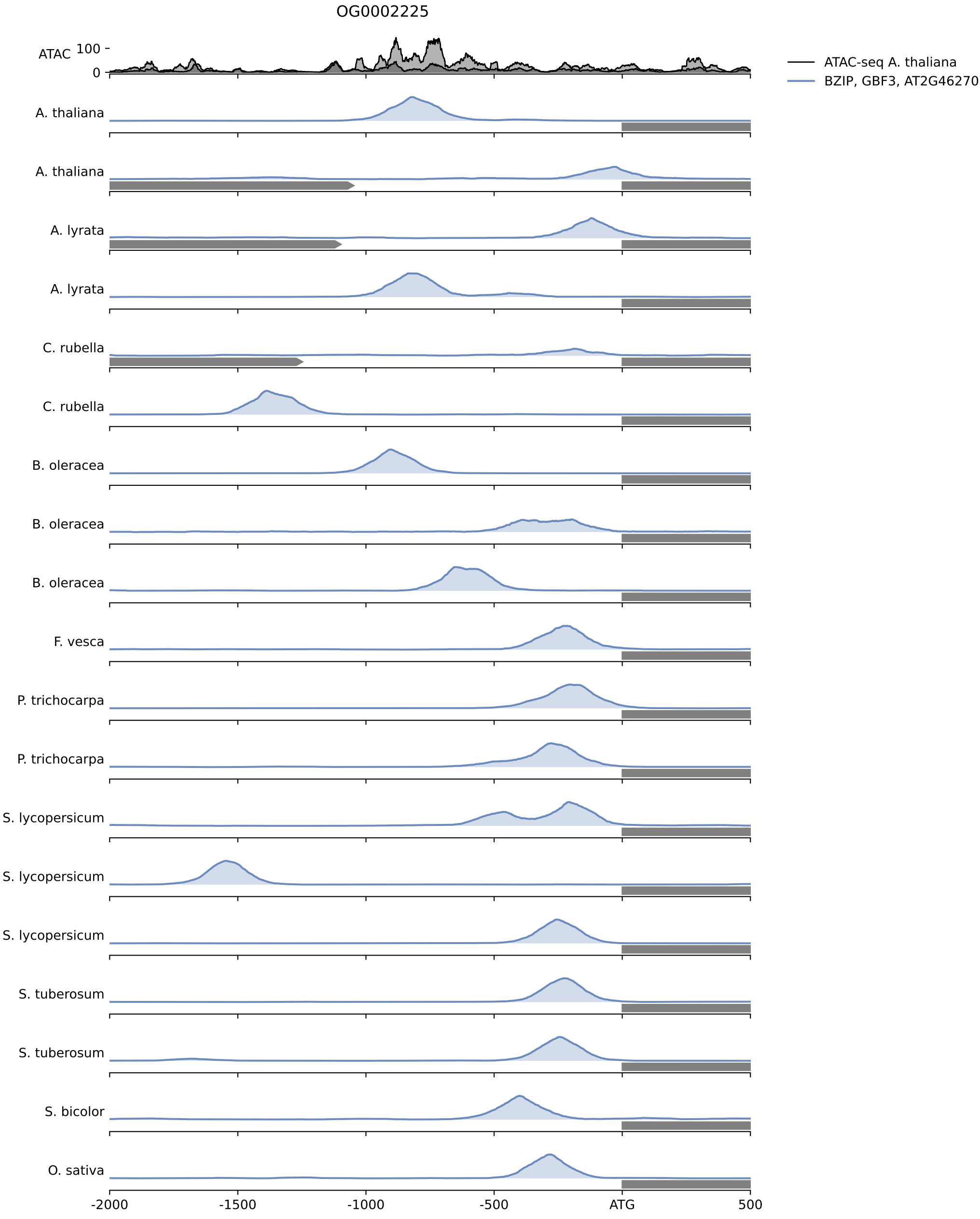
A. thaliana target: AT3G16490, IQD26, Member of IQ67 (CaM binding) domain containing family.

A. thaliana target: AT1G51960, IQD27, Member of IQ67 (CaM binding) domain containing family.



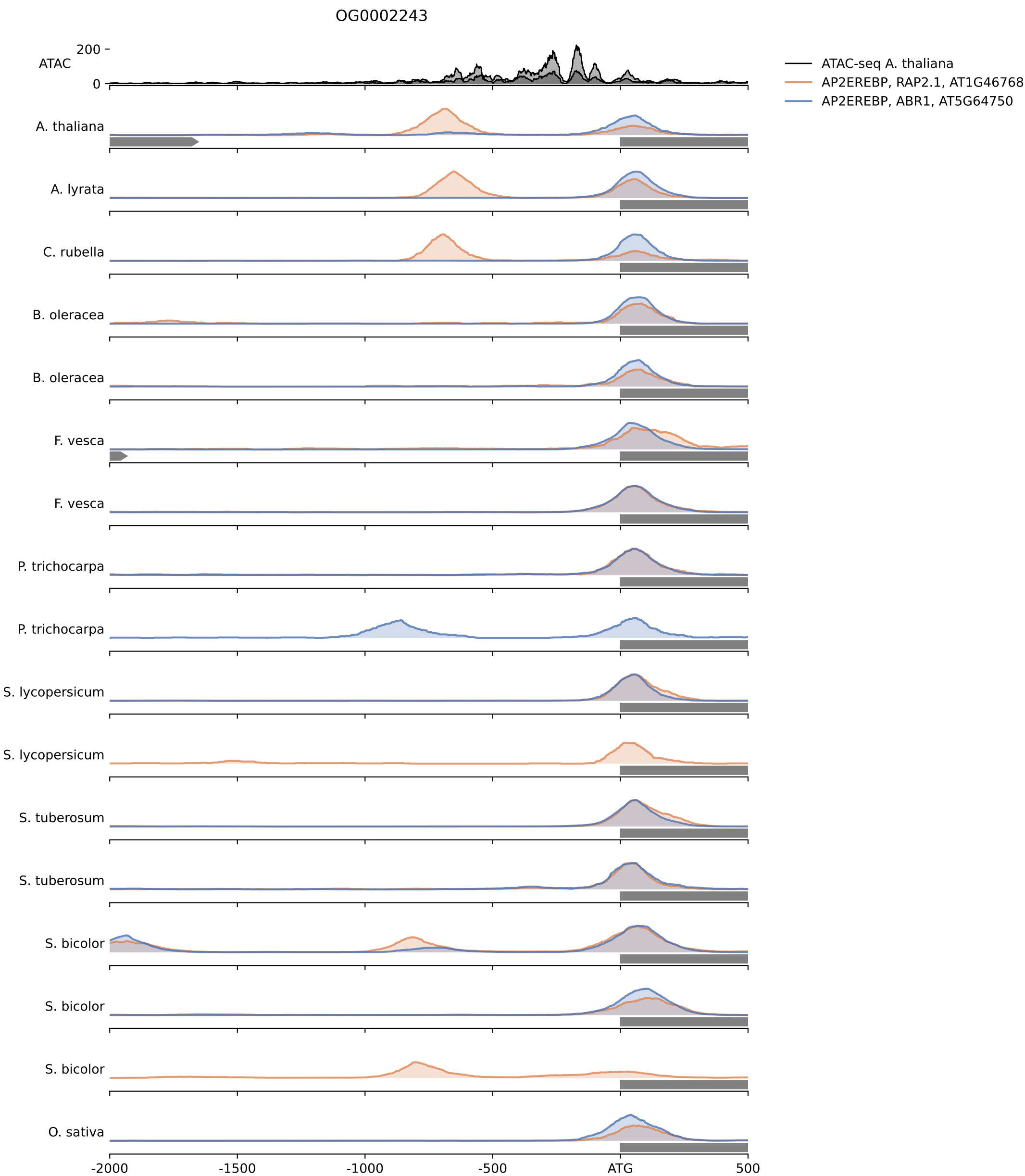
A. thaliana target: AT1G68410, Protein phosphatase 2C family protein;(source:Araport11)

A. thaliana target: AT1G09160, Protein phosphatase 2C family protein;(source:Araport11)

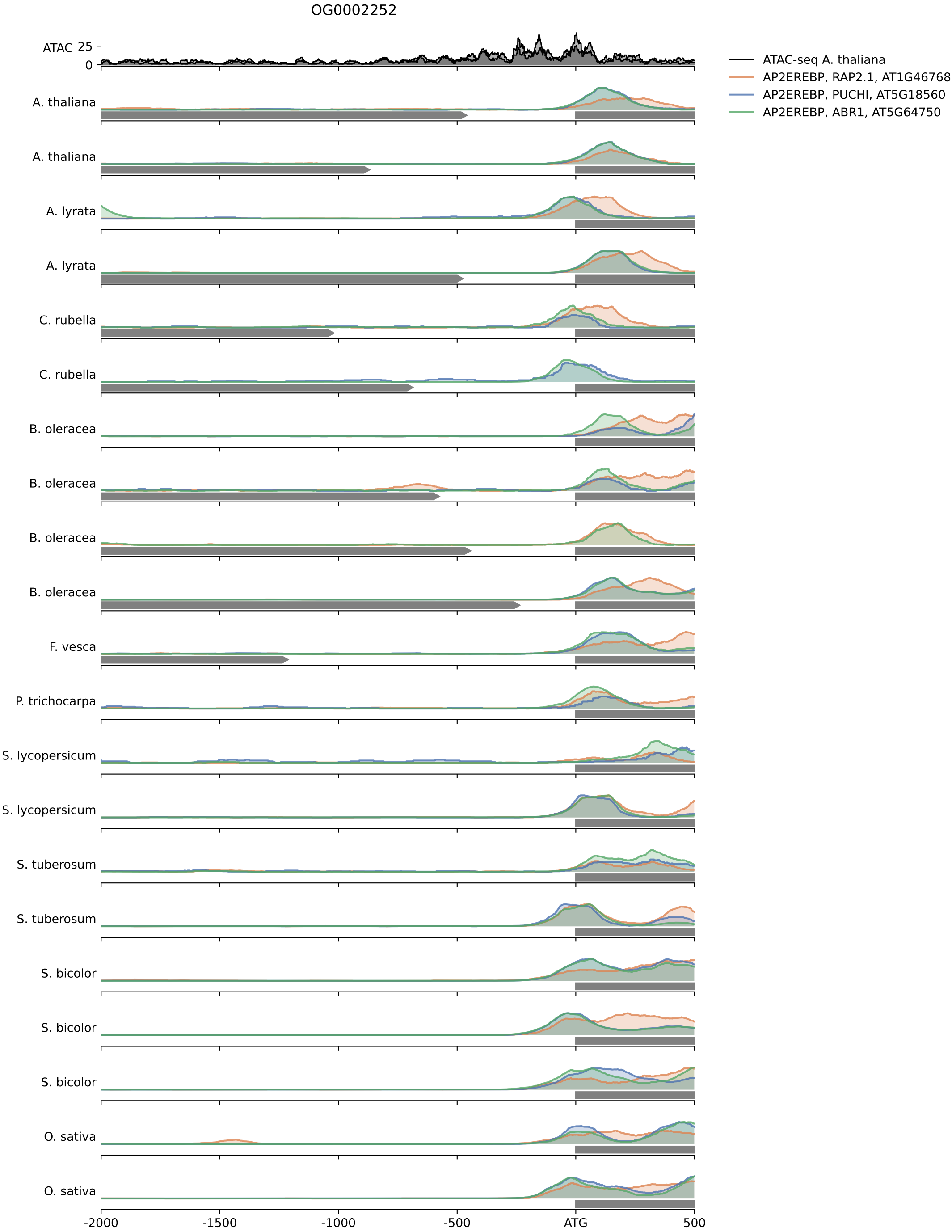


A. thaliana target: AT1G15380, GLYI4, Glyoxalase which affects ABA?JA crosstalk. Member of the GLYI family. glyI4 mutant plants show a general stress phenotype characterized by compromised MG scavenging, accumulation of reactive oxygen species (ROS), stomatal closure, andreduced fitness was observed.

A. thaliana target: AT1G80160, GLYI7, Vicinal oxygen chelate (VOC) superfamily member.

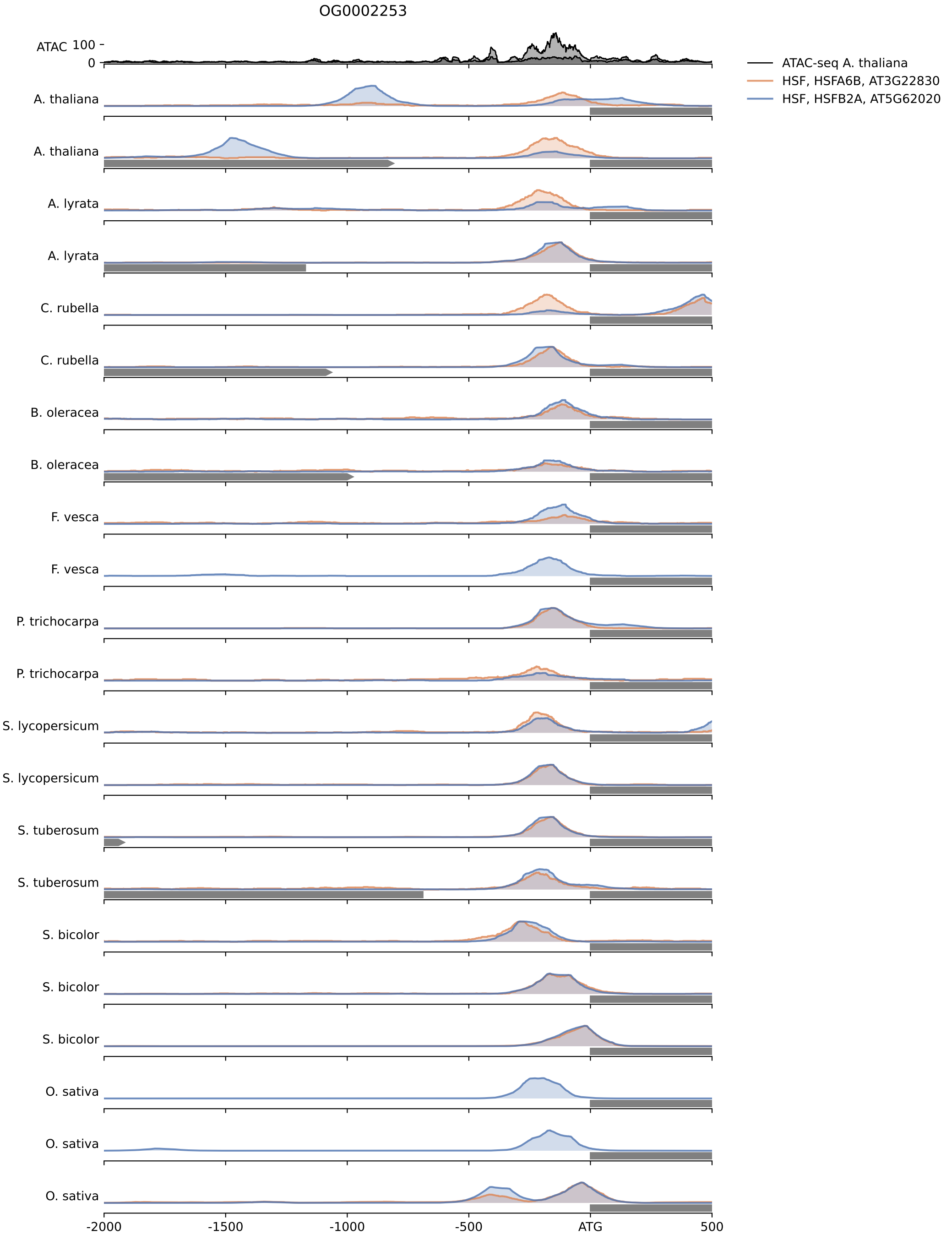


A. thaliana target: AT2G19860, HXK2, Encodes a protein with hexokinase activity (AtHXK2) and acts as a sensor for plant sugar responses.



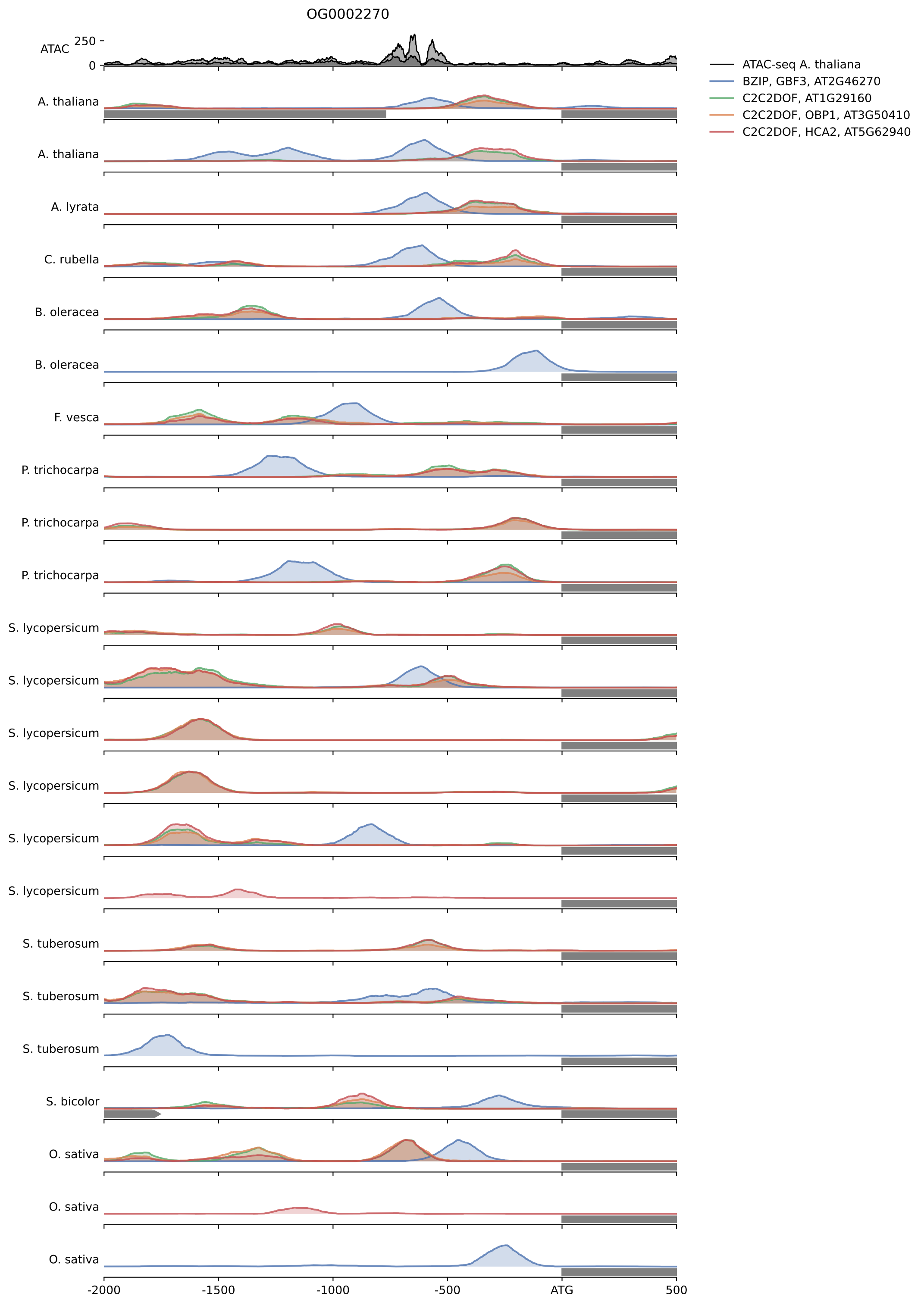
A. thaliana target: AT4G35460, NTRB, NADPH-dependent thioredoxin reductase 1 (NTR1. Similar to E.coli NTR and has conserved NADPH binding domains.

A. thaliana target: AT2G17420, NTRA, NADPH-dependent thioredoxin reductase, major cytosolic isoform The mRNA is cell-to-cell mobile.



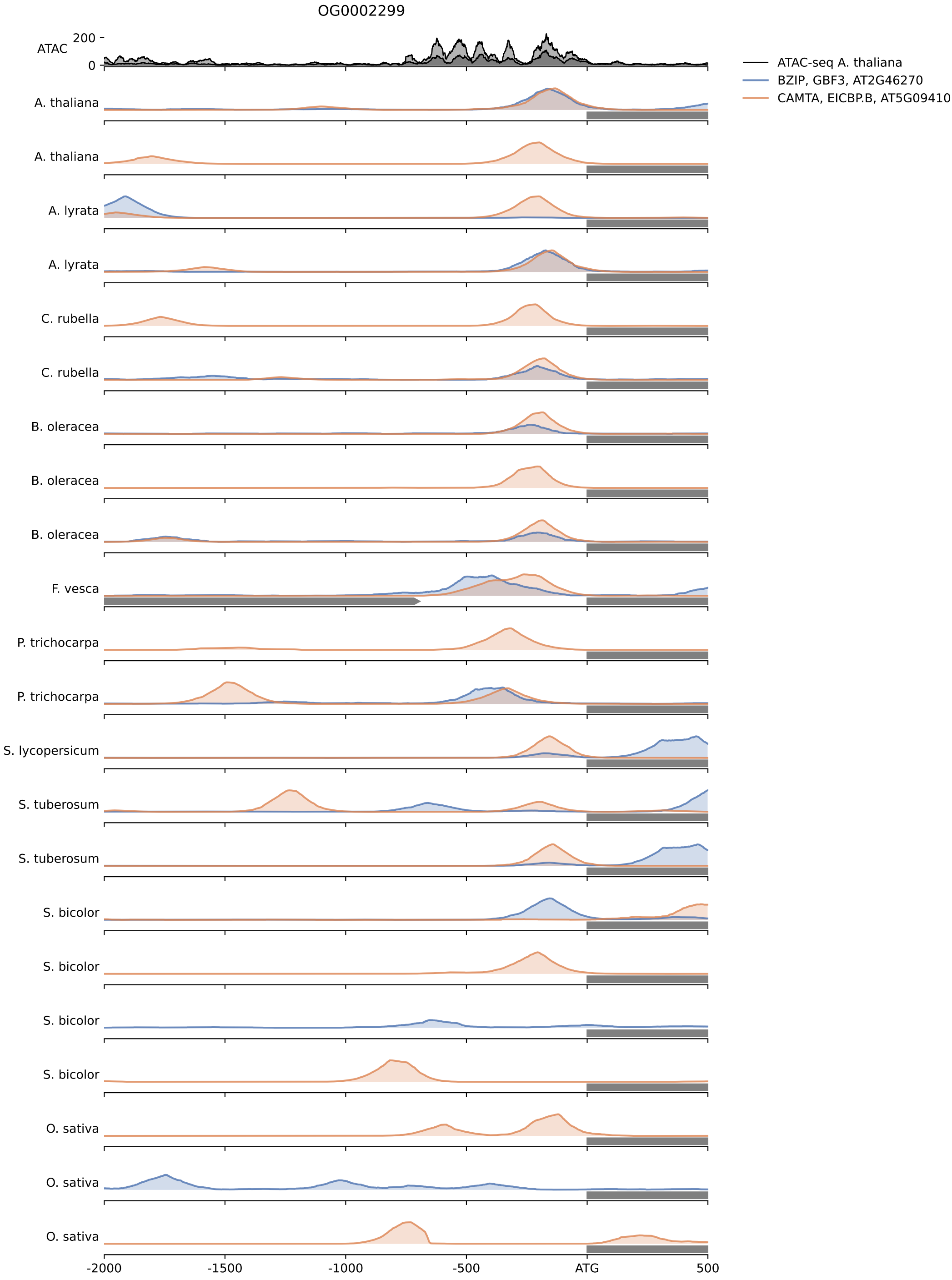
A. thaliana target: AT3G25230, ROF1, Encodes a a high molecular weight member of the FK506 binding protein (FKBP) family. It has three FKBP12-like domains, tetratricopeptide repeats, and a putative calmodulin binding domain. Modulates thermotolerance by interacting with HSP90.1 and affecting the accumulation of HsfA2-regulated sHSPs. Belongs to one of the 36 carboxylate clamp (CC)-tetratricopeptide repeat (TPR) proteins (Prasad 2010, Pubmed ID: 20856808) with potential to interact with Hsp90/Hsp70 as co-chaperones.

A. thaliana target: AT5G48570, Encodes one of the 36 carboxylate clamp (CC)-tetratricopeptide repeat (TPR) proteins (Prasad 2010, Pubmed ID: 20856808) with potential to interact with Hsp90/Hsp70 as co-chaperones.



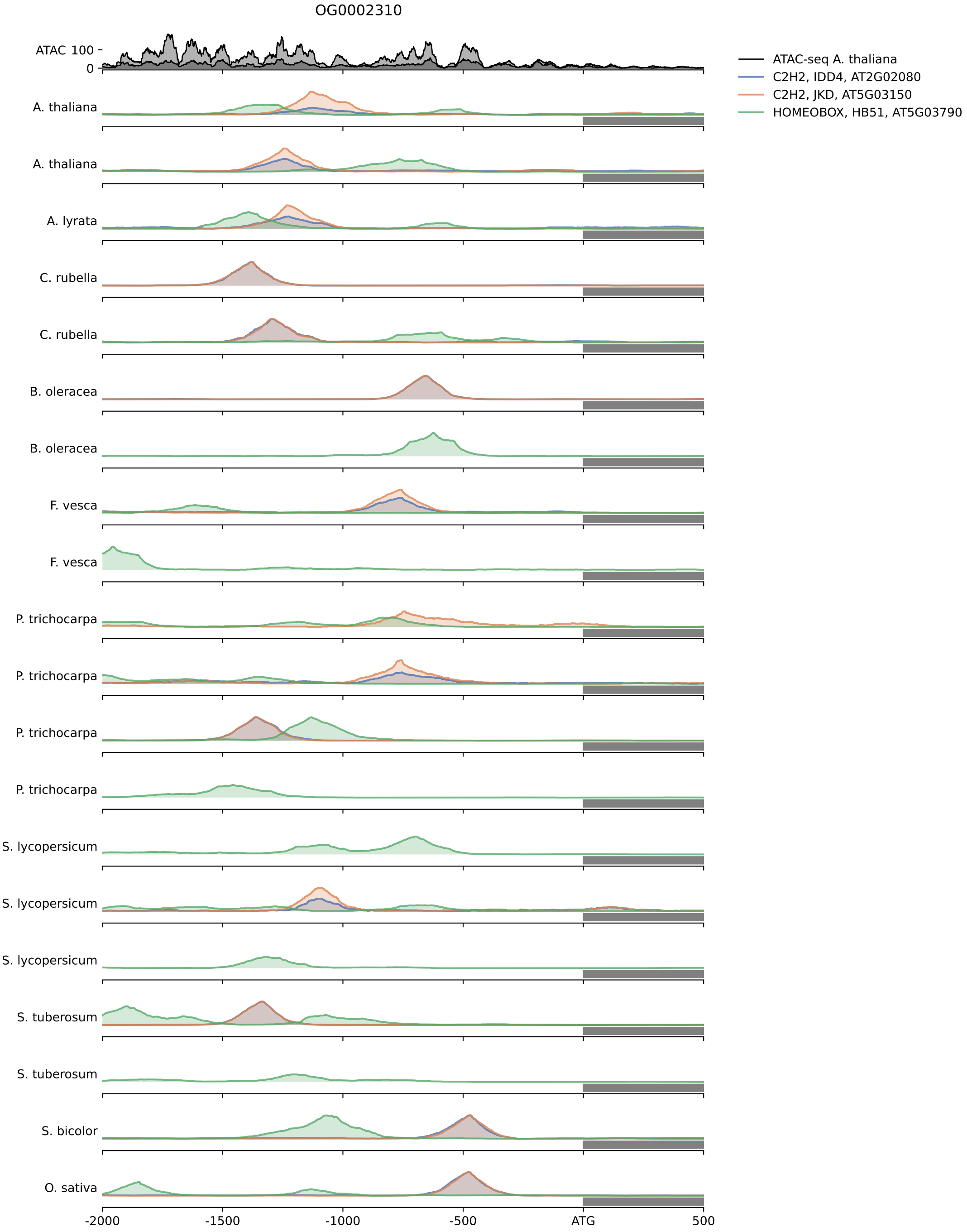
A. thaliana target: AT2G09970, DUF1677 family protein (DUF1677);(source:Araport11)

A. thaliana target: AT1G72510, DUF1677 family protein (DUF1677);(source:Araport11)



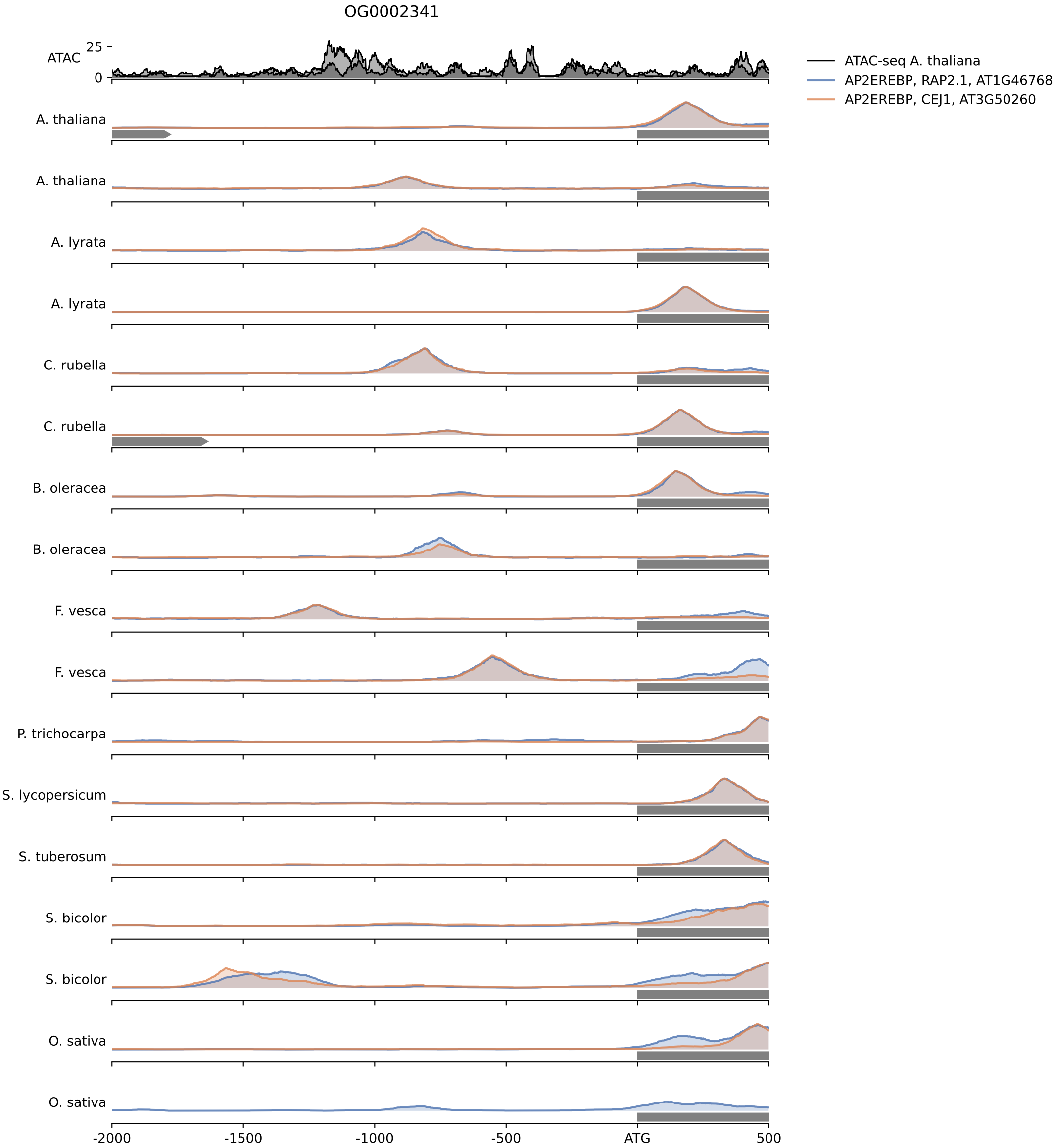
A. thaliana target: AT2G41010, CAMBP25, Encodes a novel calmodulin binding protein whose gene expression is induced by dehydration and ionic (salt) and non-ionic (mannitol) osmotic stress. Lines over-expressing this gene are more sensitive and anti-sense lines are more tolerant to osmotic stress, suggesting this gene may be a negative regulator of response to osmotic stress.

A. thaliana target: AT3G56880, VQ motif-containing protein;(source:Araport11)



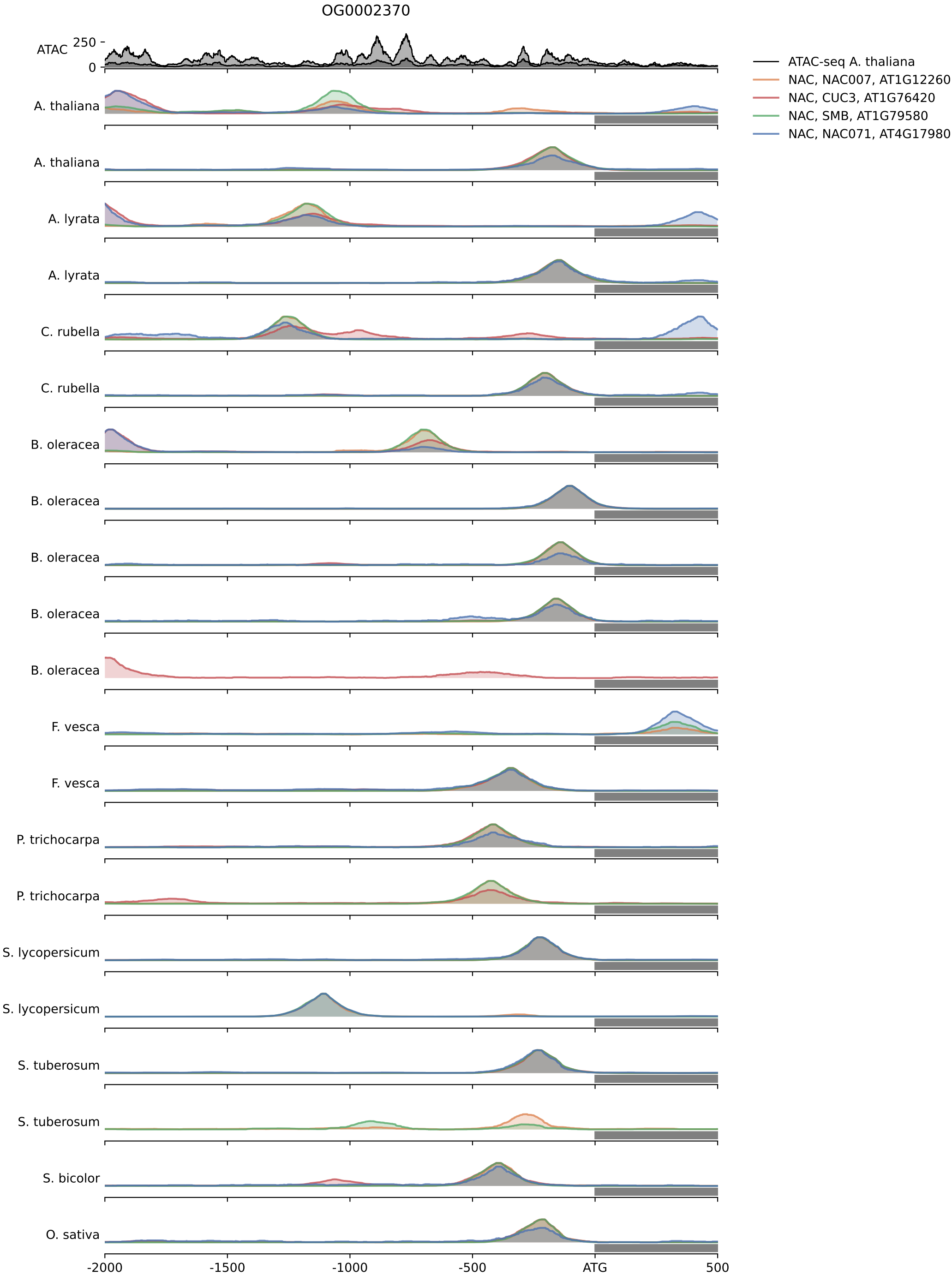
A. thaliana target: AT3G50700, IDD2, zinc finger protein, similar to maize Indeterminate1 (ID1)

A. thaliana target: AT5G66730, IDD1, C2H2-like zinc finger protein;(source:Araport11)



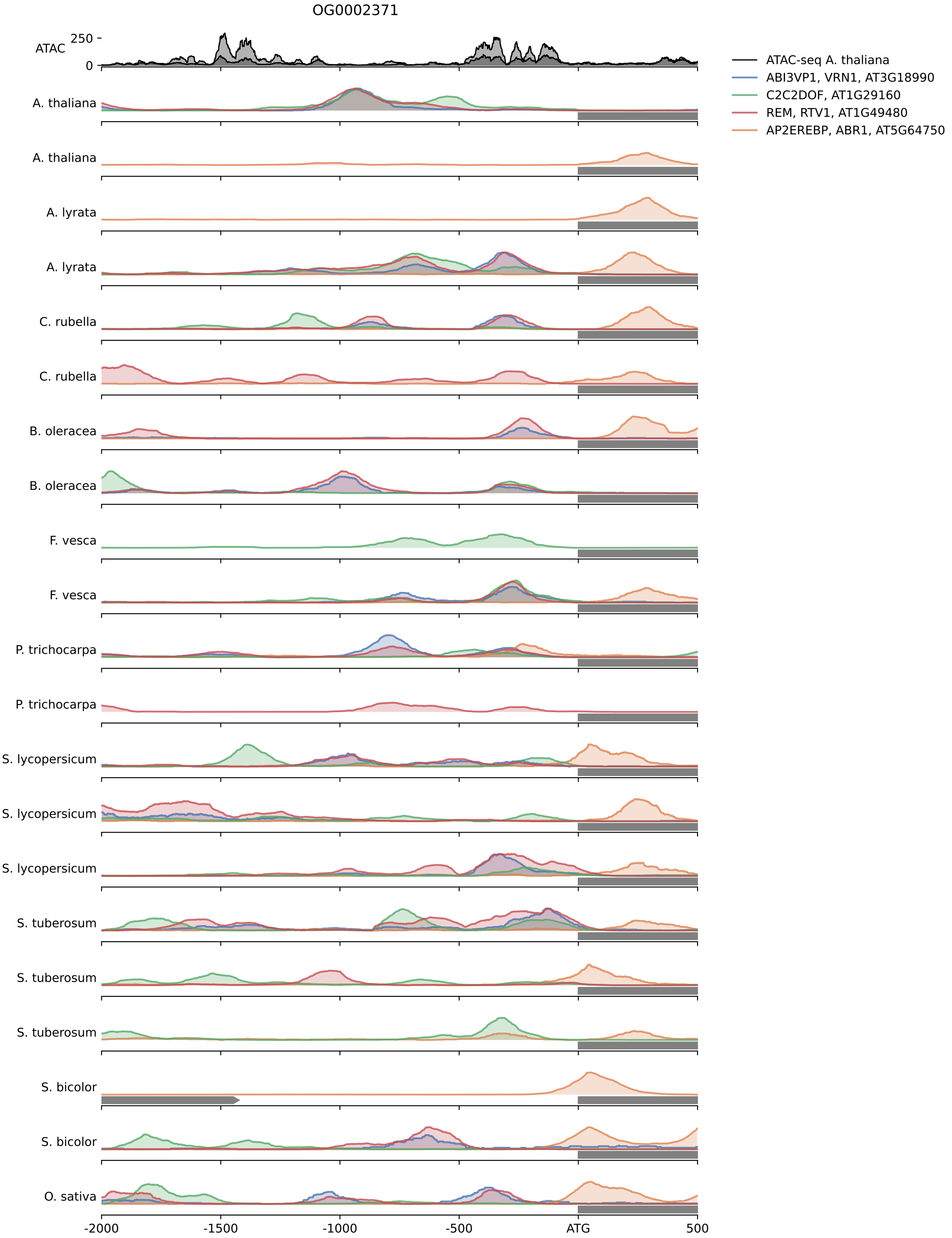
A. thaliana target: AT5G02190, PCS1, encodes an aspartic protease, has an important role in determining cell fate during embryonic development and in reproduction processes. The loss-of-function mutation of PCS1 causes degeneration of both male and female gametophytes and excessive cell death of developing embryos during torpedo stage.

A. thaliana target: AT2G39710, Encodes a Cysteine-rich peptide (CRP) family protein



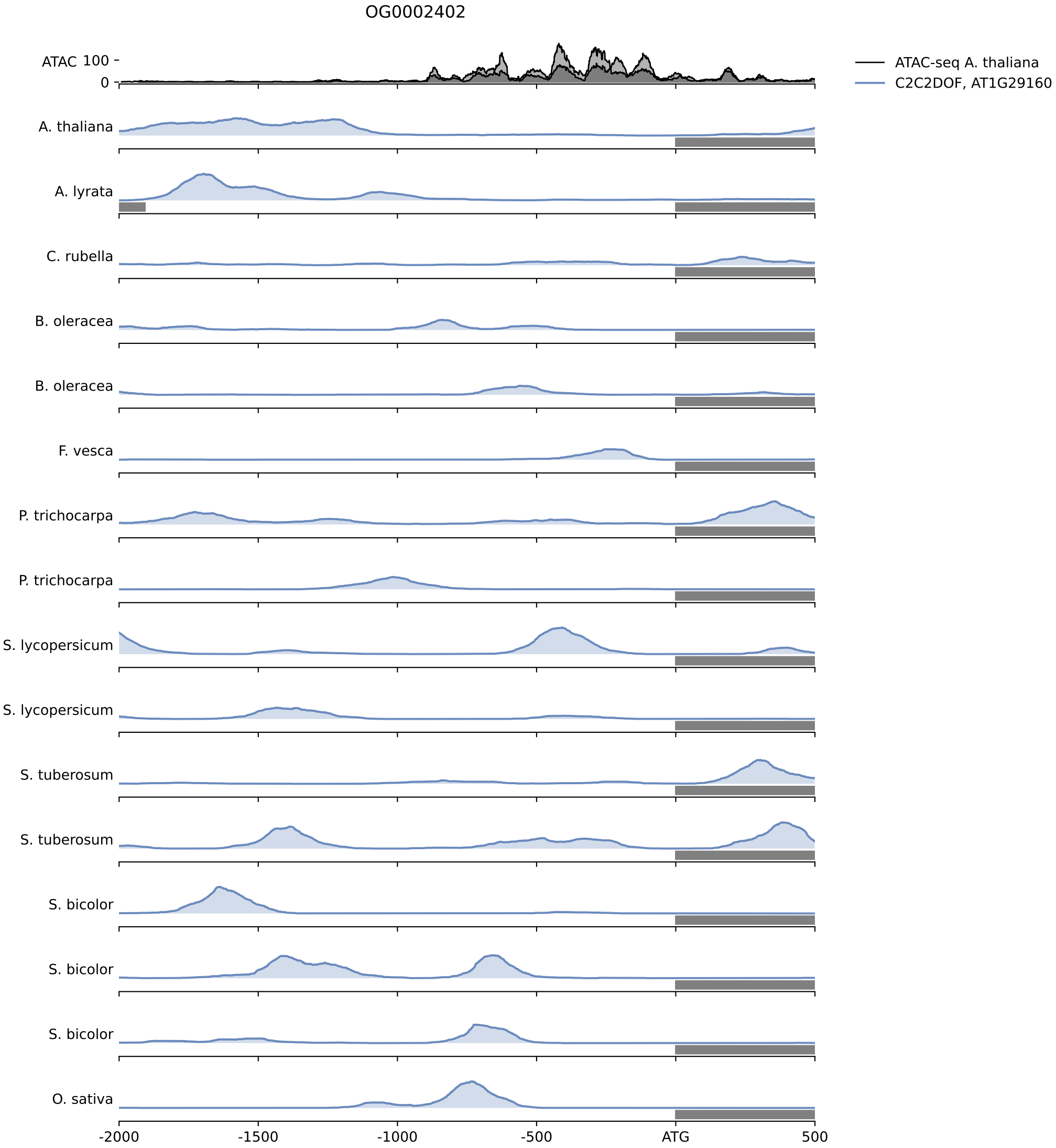
A. thaliana target: AT2G33480, NAC041, NAC domain containing protein 41;(source:Araport11)

A. thaliana target: AT5G13180, NAC083, Encodes a NAC domain transcription factor that interacts with VND7 and negatively regulates xylem vessel formation; expression is both positively and negatively regulated in the transcriptional cascade involved in xylem vessel formation.

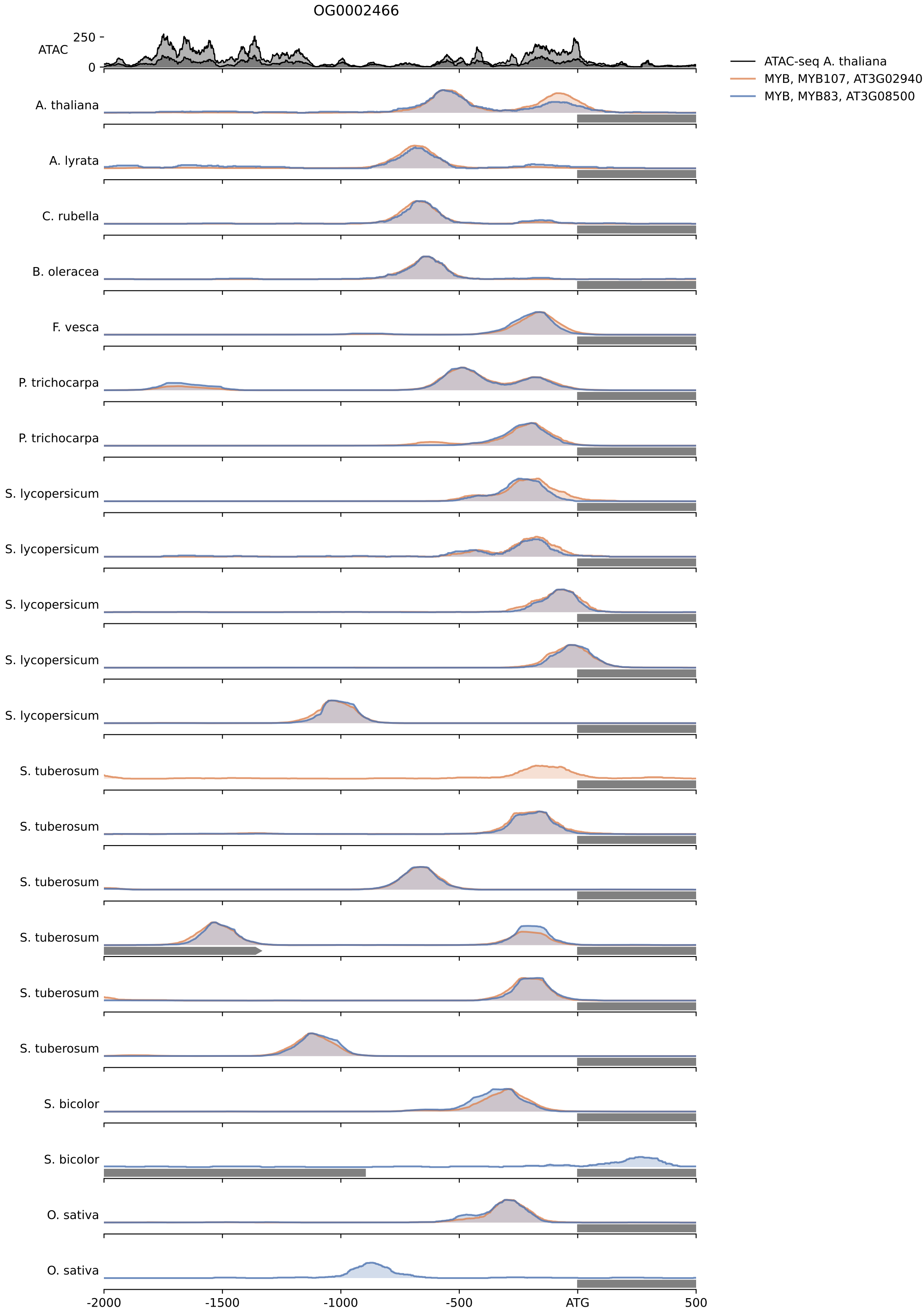


A. thaliana target: AT2G28890, PLL4, Encodes a protein phosphatase 2C like gene, similar to POL. Involved in leaf development. Knockout mutants have abnormally shaped leaves.

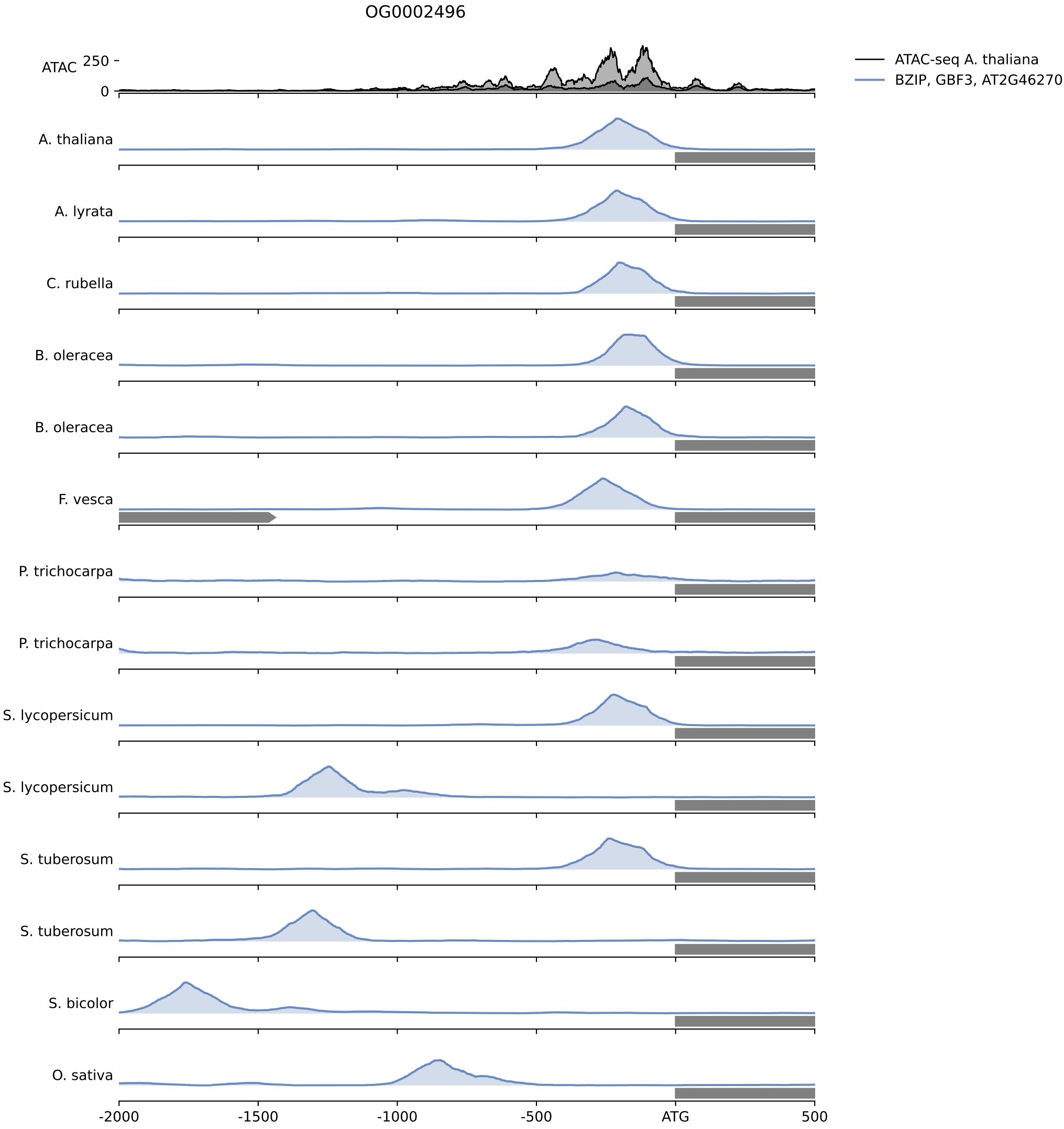
A. thaliana target: AT1G07630, PLL5, Encodes a protein phosphatase 2C like gene, similar to POL. Involved in leaf development. Knockout mutants have abnormally shaped leaves.



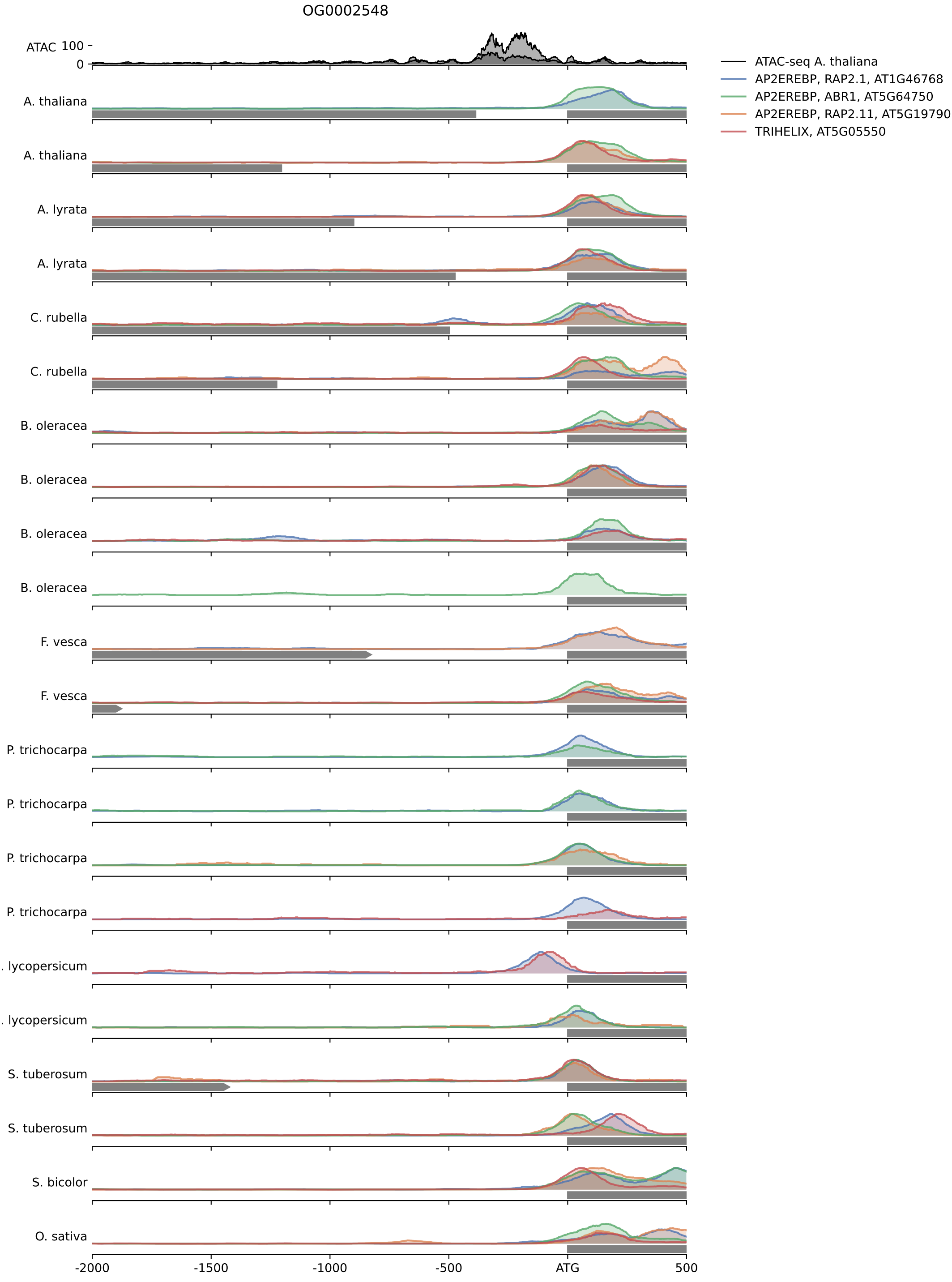
A. thaliana target: AT4G02600, MLO1, A member of a large family of seven-transmembrane domain proteins specific to plants, homologs of the barley mildew resistance locus o (MLO) protein. The Arabidopsis genome contains 15 genes encoding MLO proteins, with localization in plasma membrane. Phylogenetic analysis revealed four clades of closely-related AtMLO genes. ATMLO1 belongs to the clade II, with ATMLO13 and ATMLO15. The gene is expressed during early seedling growth, in root and cotyledon vascular system, in pollen and in papillae, as shown by GUS activity patterns. The expression of several phylogenetically closely-related AtMLO genes showed similar or overlapping tissue specificity and analogous responsiveness to external stimuli, suggesting functional redundancy, co-function, or antagonistic function(s).



A. thaliana target: AT4G34050, CCoAOMT1, Methyltransferase in the lignin biosynthetic pathway.

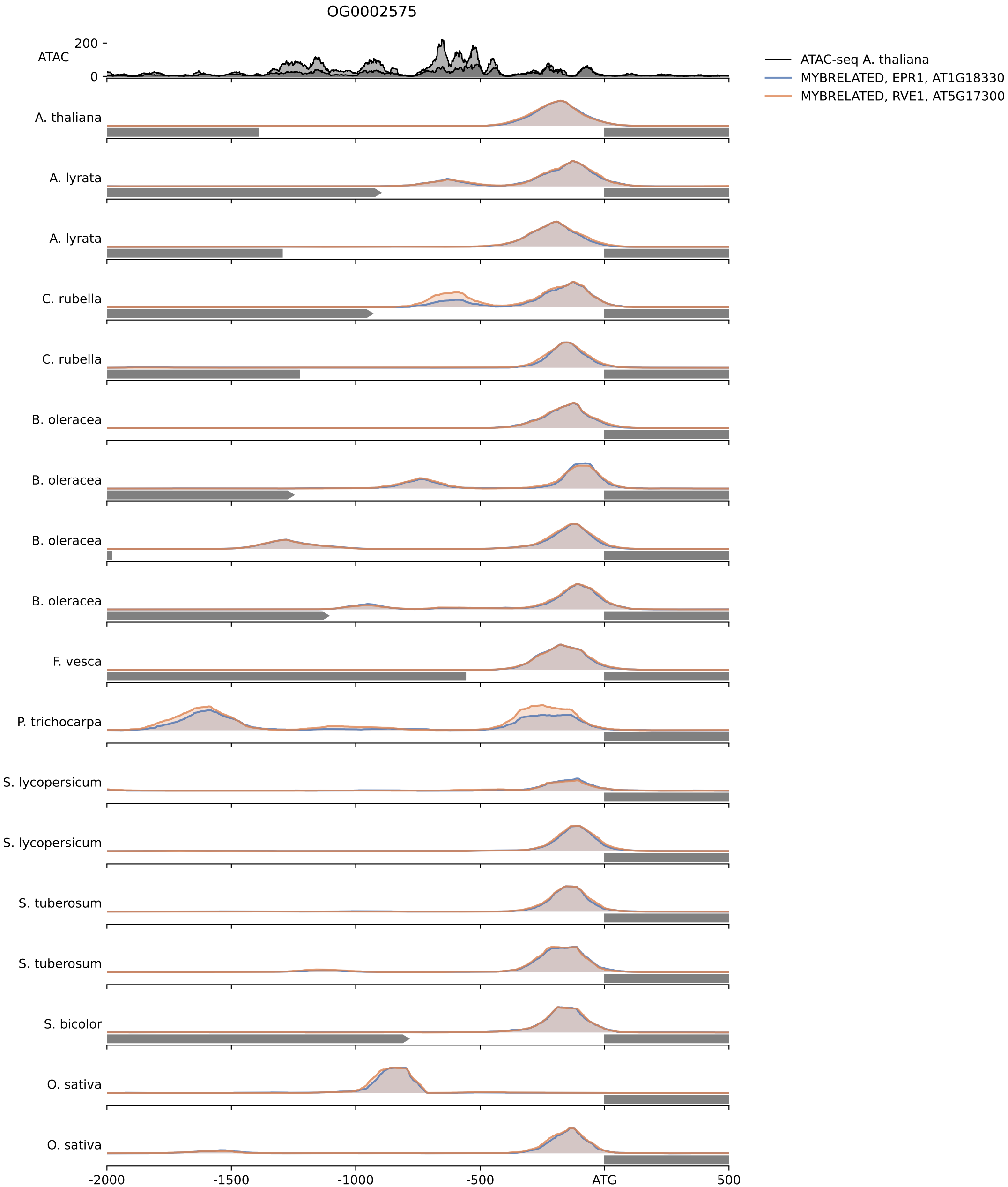


A. thaliana target: AT2G15695, peptide methionine sulfoxide reductase (Protein of unknown function DUF829, transmembrane 53);(source:Araport11)

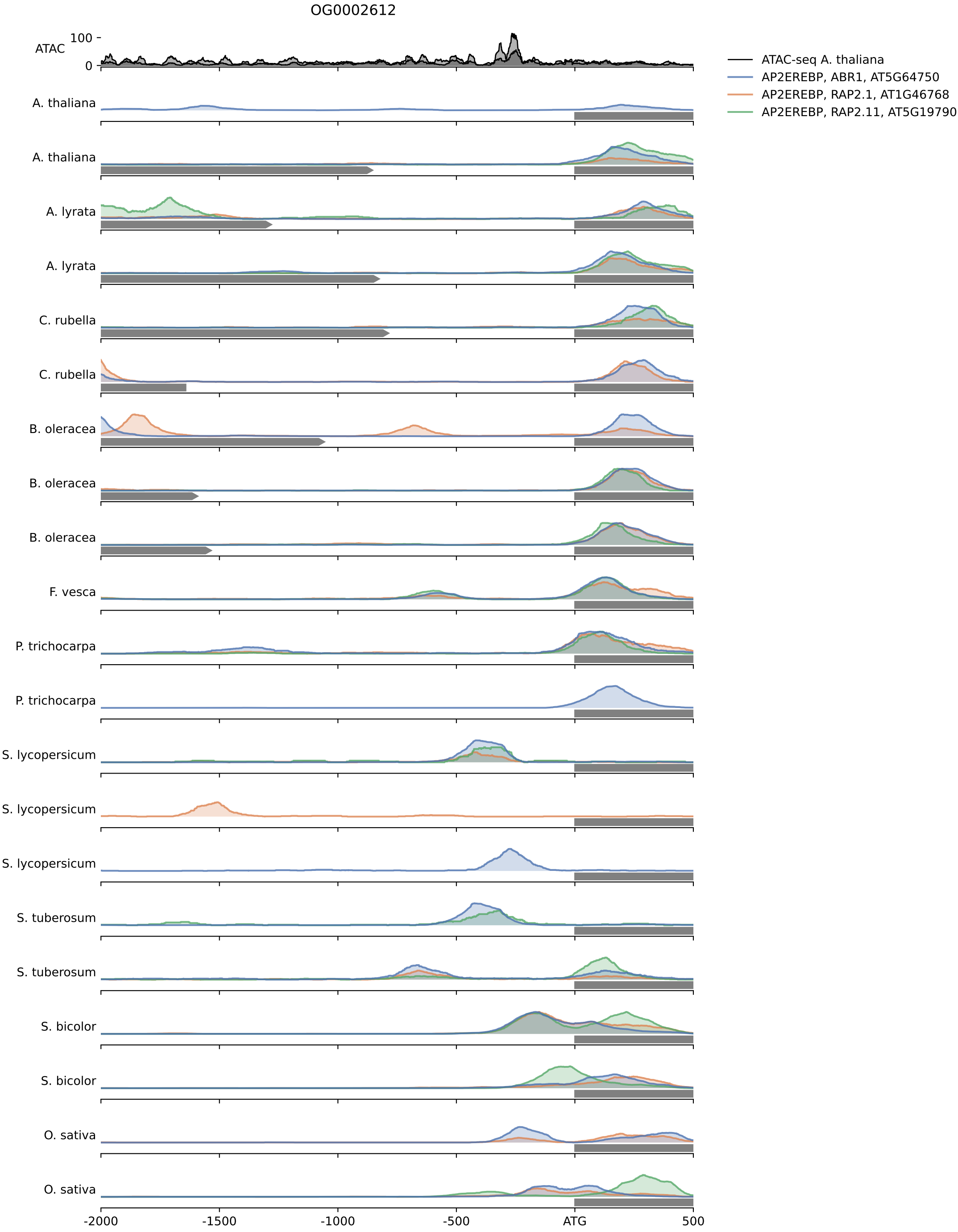


A. thaliana target: AT3G48800, Sterile alpha motif (SAM) domain-containing protein;(source:Araport11)

A. thaliana target: AT5G23680, Sterile alpha motif (SAM) domain-containing protein;(source:Araport11)

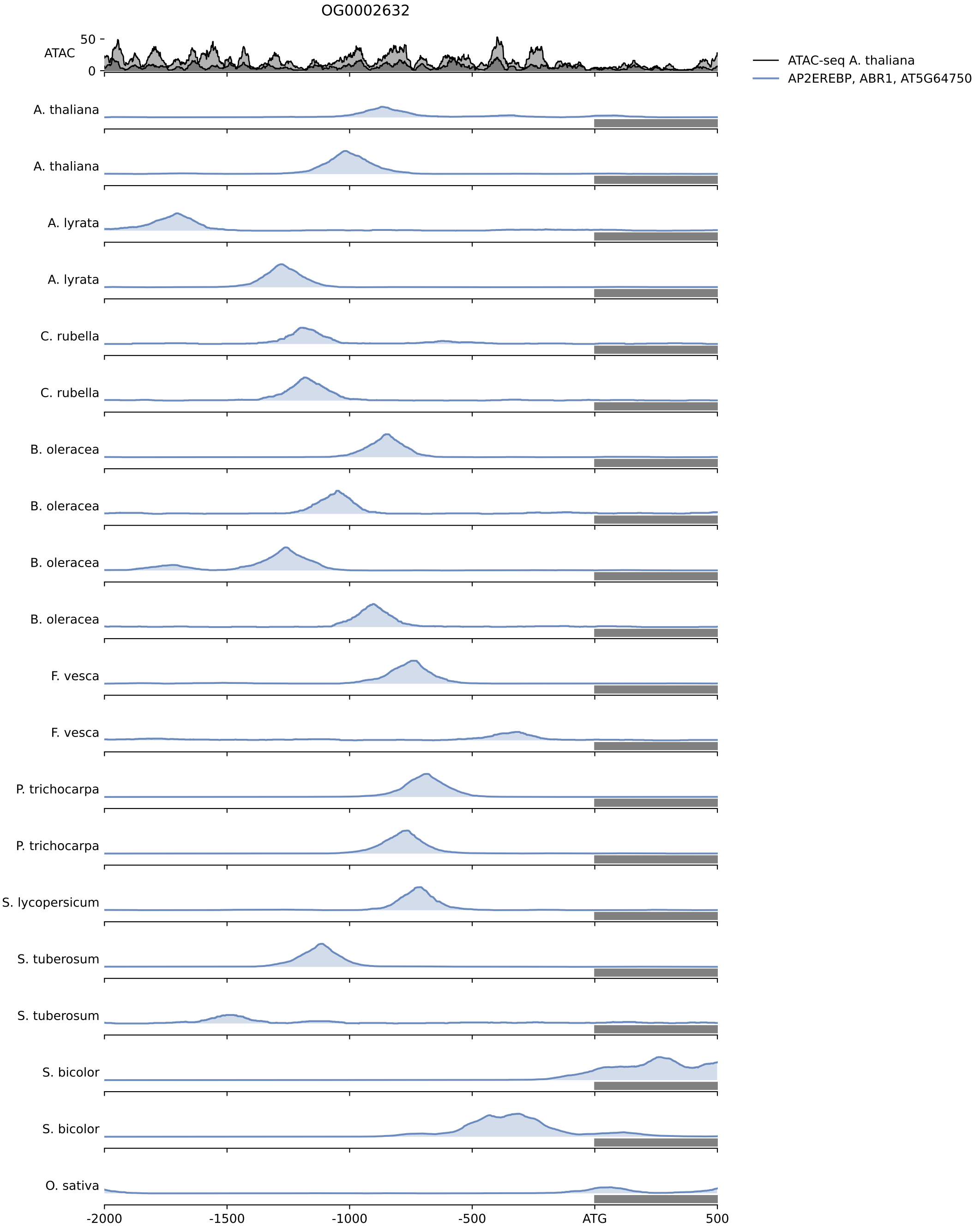


A. thaliana target: AT3G53460, CP29, Encodes a nuclear gene with a consensus RNA-binding domain that is localized to the chloroplast.



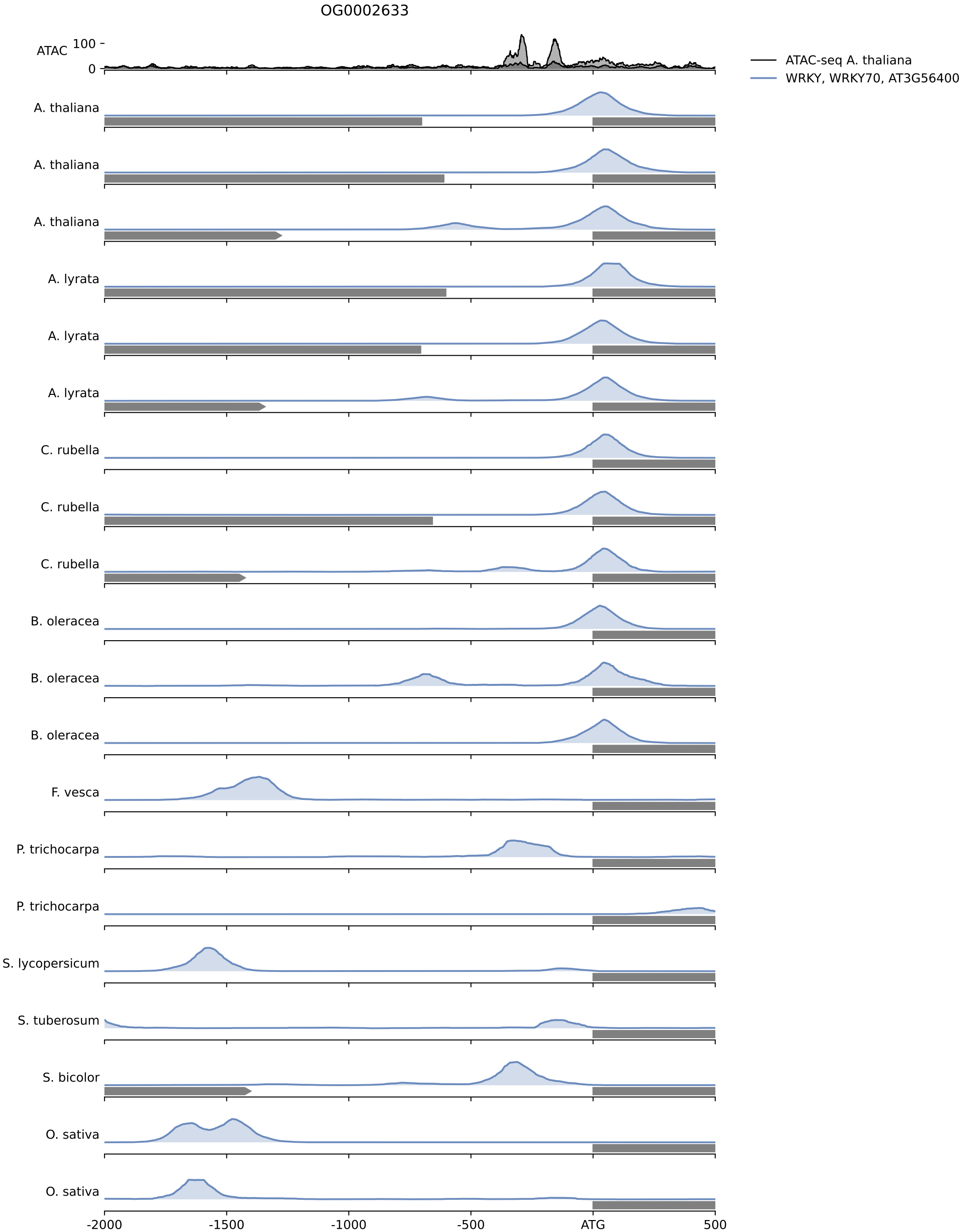
A. thaliana target: AT2G27210, BSL3, Protein phosphatase which promotes stomatal ACD by establishing kinase-based signalling asymmetry in the two daughter cells.

A. thaliana target: AT1G08420, BSL2, Protein phosphatase which promotes stomatal ACD by establishing kinase-based signalling asymmetry in the two daughter cells.



A. thaliana target: AT2G23060, Acyl-CoA N-acyltransferases (NAT) superfamily protein;(source:Araport11)

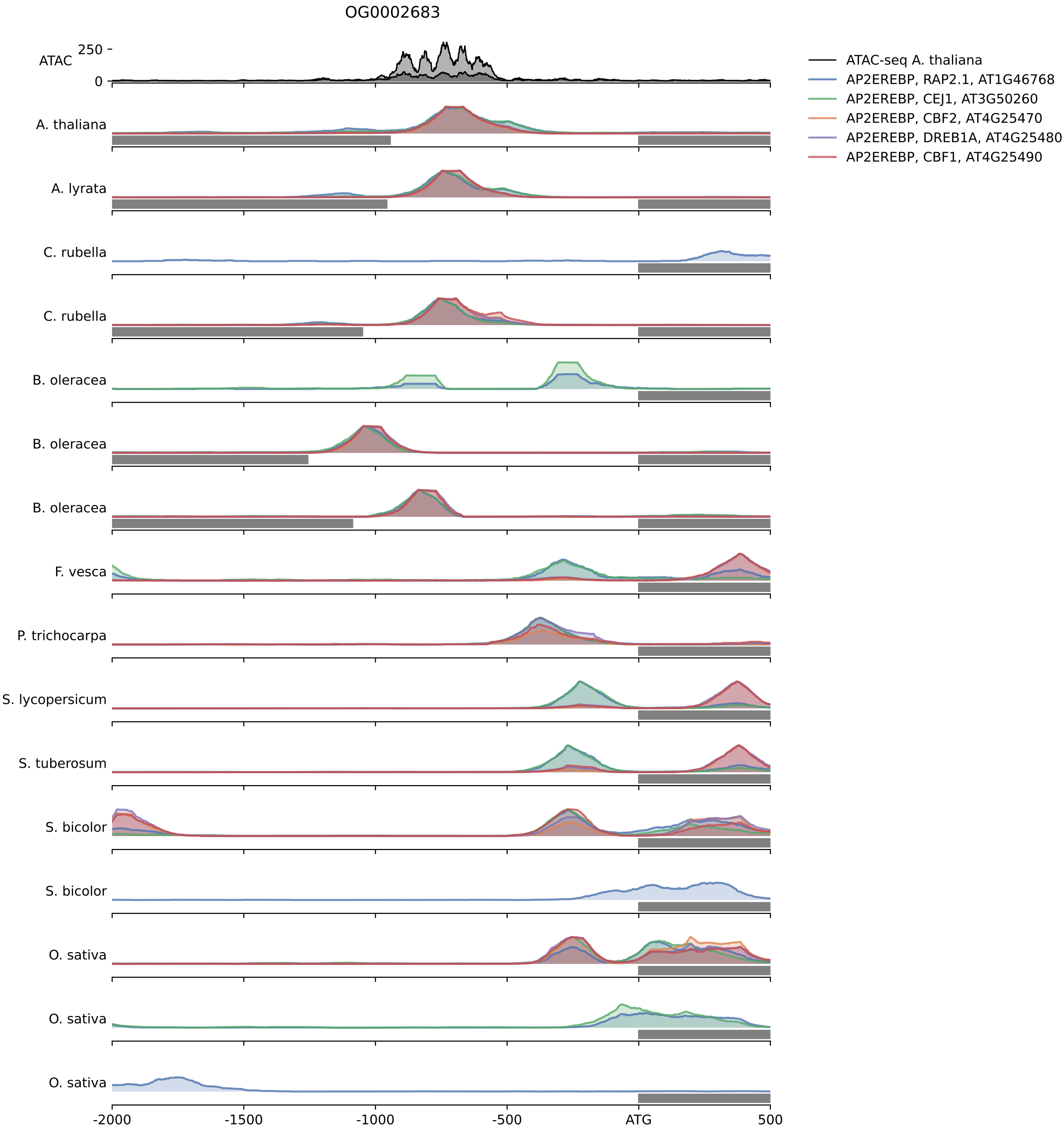
A. thaliana target: AT4G37580, HLS1, involved in apical hook development. putative N-acetyltransferase



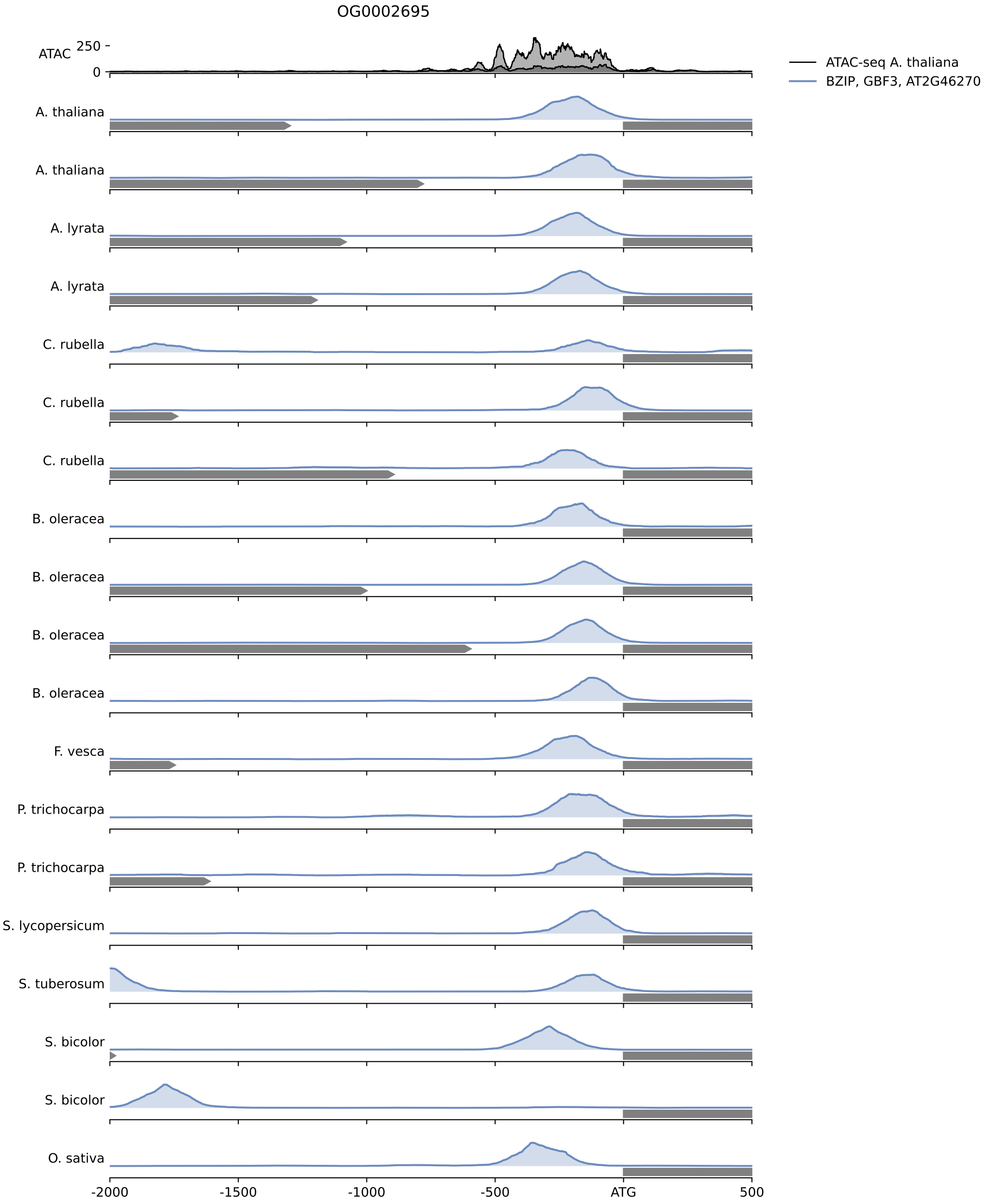
A. thaliana target: AT4G20110, VSR7, VACUOLAR SORTING RECEPTOR 7;(source:Araport11)

A. thaliana target: AT2G34940, VSR5, VACUOLAR SORTING RECEPTOR 5;(source:Araport11)

A. thaliana target: AT1G30900, VSR6, VACUOLAR SORTING RECEPTOR 6;(source:Araport11)

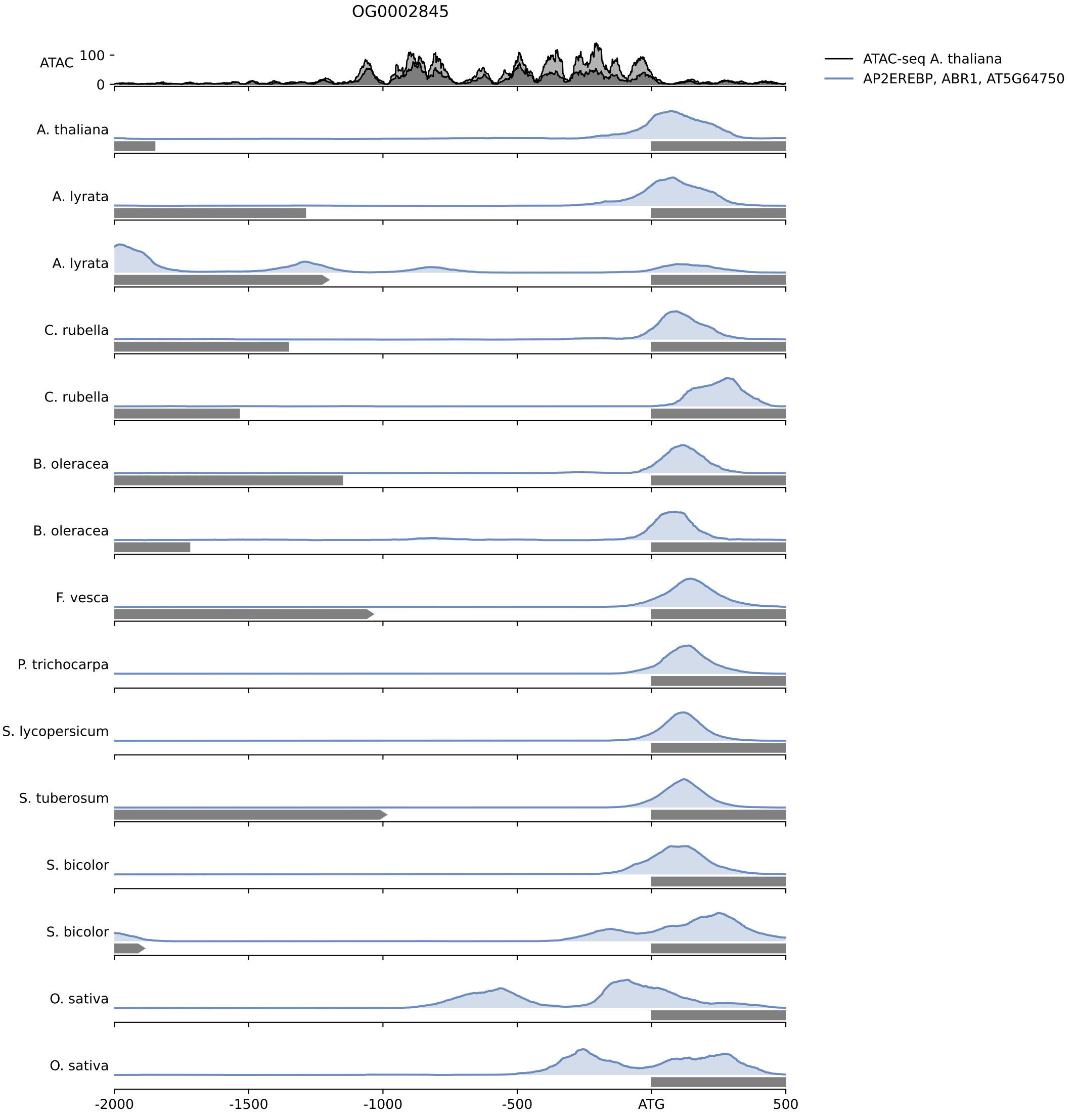


A. thaliana target: AT1G05850, POM1, Encodes an endo chitinase-like protein AtCTL1. Essential for tolerance to heat, salt and drought stresses. Also involved in root hair development, cell expansion and response to cytokinin. Allelic to erh2. 11 alleles described in Hauser (1995). Mutant is defective in acquired thermotolerance, appears semidwarf throughout its life cycle and has extra lateral branches. There are two EMS alleles. Expression of AtHSP101 is not affected in the mutants.

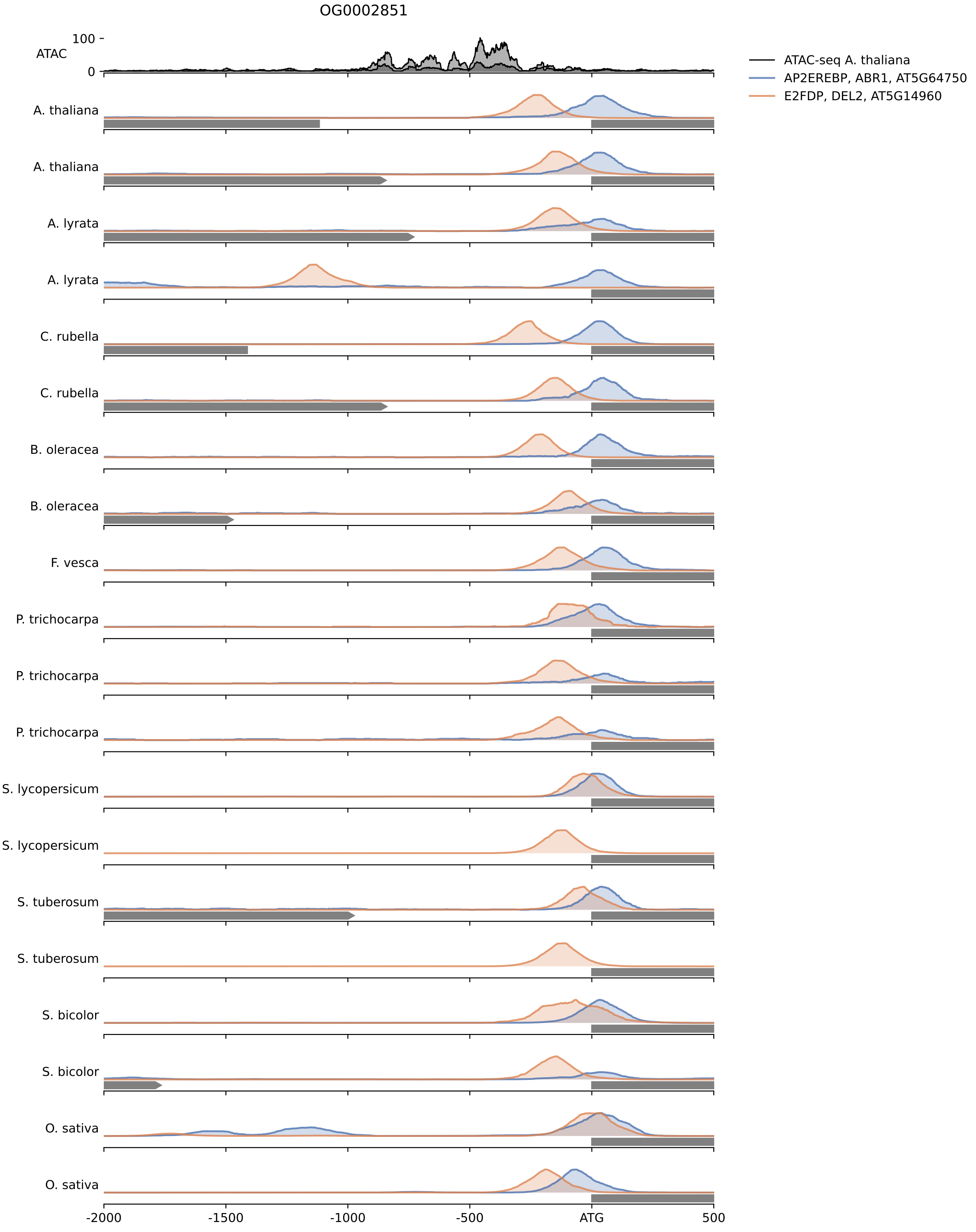


A. thaliana target: AT1G09210, CRT1b, Encodes one of three Arabidopsis calreticulins.Post-transcriptionally regulates together with CRT1 VAMP721/722 levels under ER stress.

A. thaliana target: AT1G56340, CRT1a, Encodes one of three Arabidopsis calreticulins. In CRT-deficient mouse fibroblasts, this protein restores ER Ca2+ levels. Post-transcriptionally regulates together with CRT2 VAMP721/722 levels under ER stress. Loss-of-function results in activation of the ethylene signaling pathway, reduced susceptibility to Verticillium longisporum.

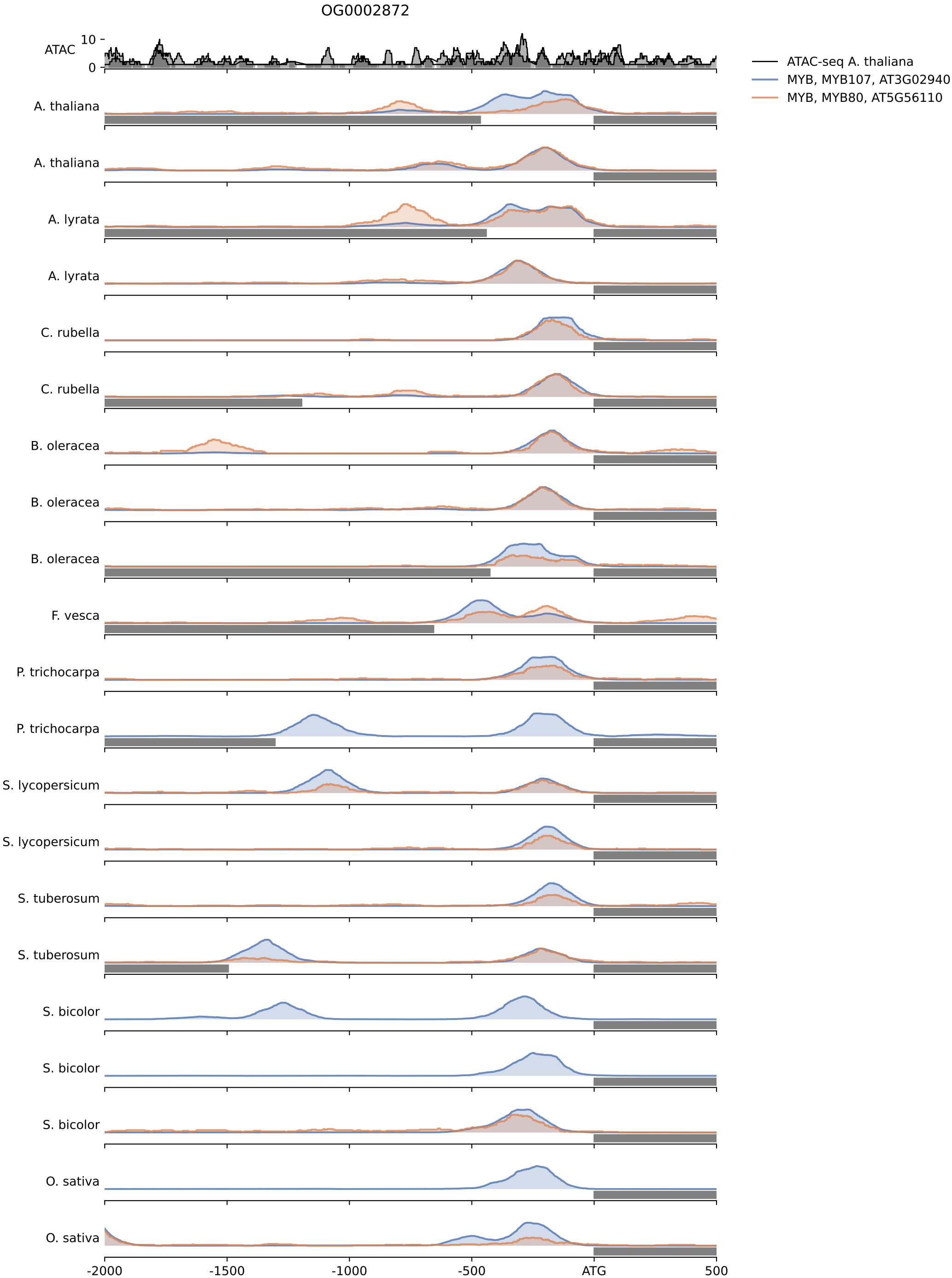


A. thaliana target: AT4G31180, The IBI1 gene encodes an aspartyl tRNA synthetase (AspRS). In addition, the IBI1 protein acts as a receptor protein of the chemical plant defence activator beta-aminobutyric acid (BABA). Binding of IBI1 to the active R-enantiomer of BABA primes non-canonical defence activity of the AspRS protein against pathogen attack.



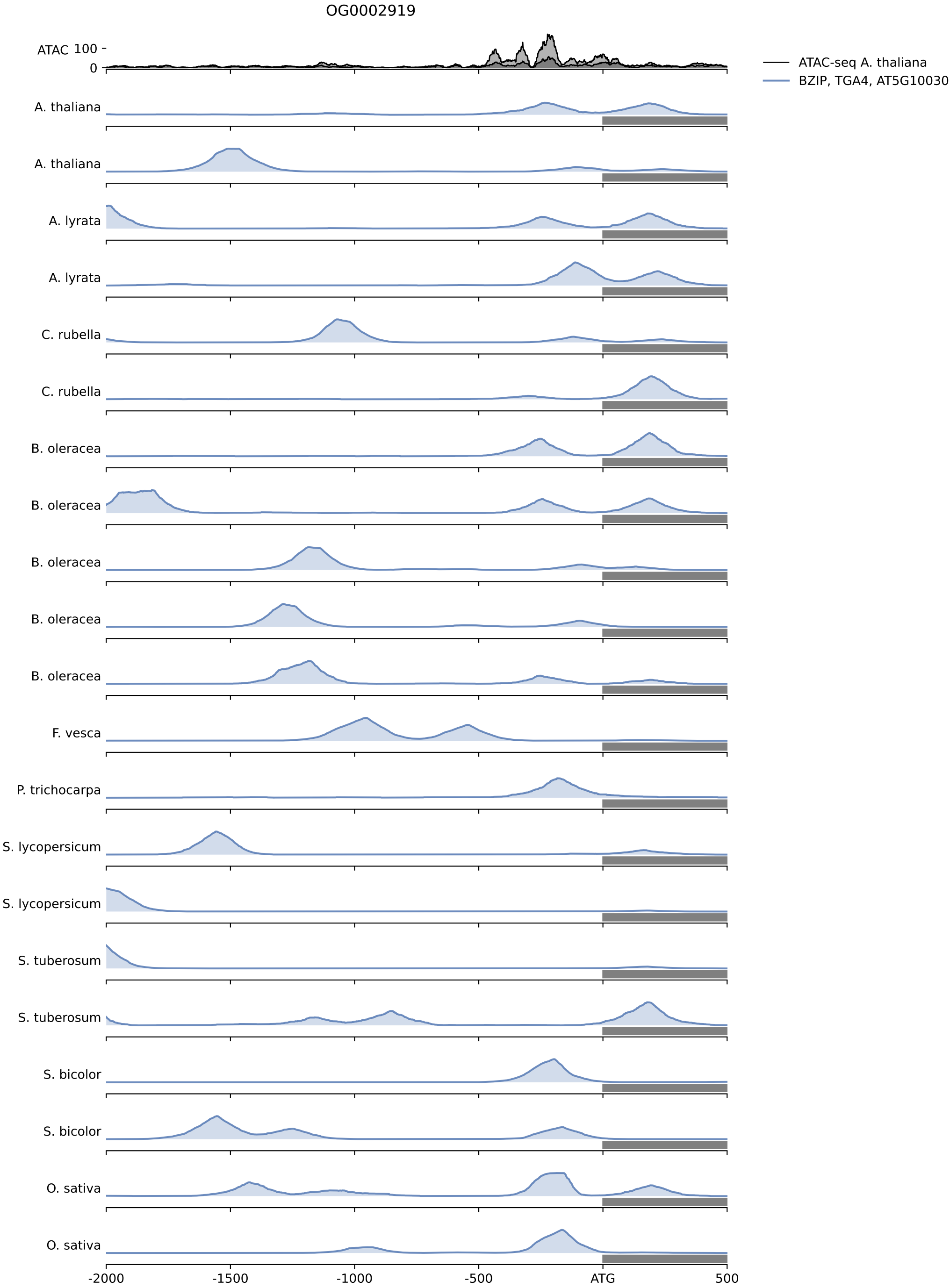
A. thaliana target: AT3G02920, RPA32B, Replication protein A, subunit RPA32;(source:Araport11)

A. thaliana target: AT2G24490, RPA2, Encodes a component of Replication Protein A. Component of transcriptional gene silencing which does not affect endogenous small RNA accumulation nor DNA methylation. Localized in the nucleus. Involved in DNA repair. Interacts physically with ROS1.



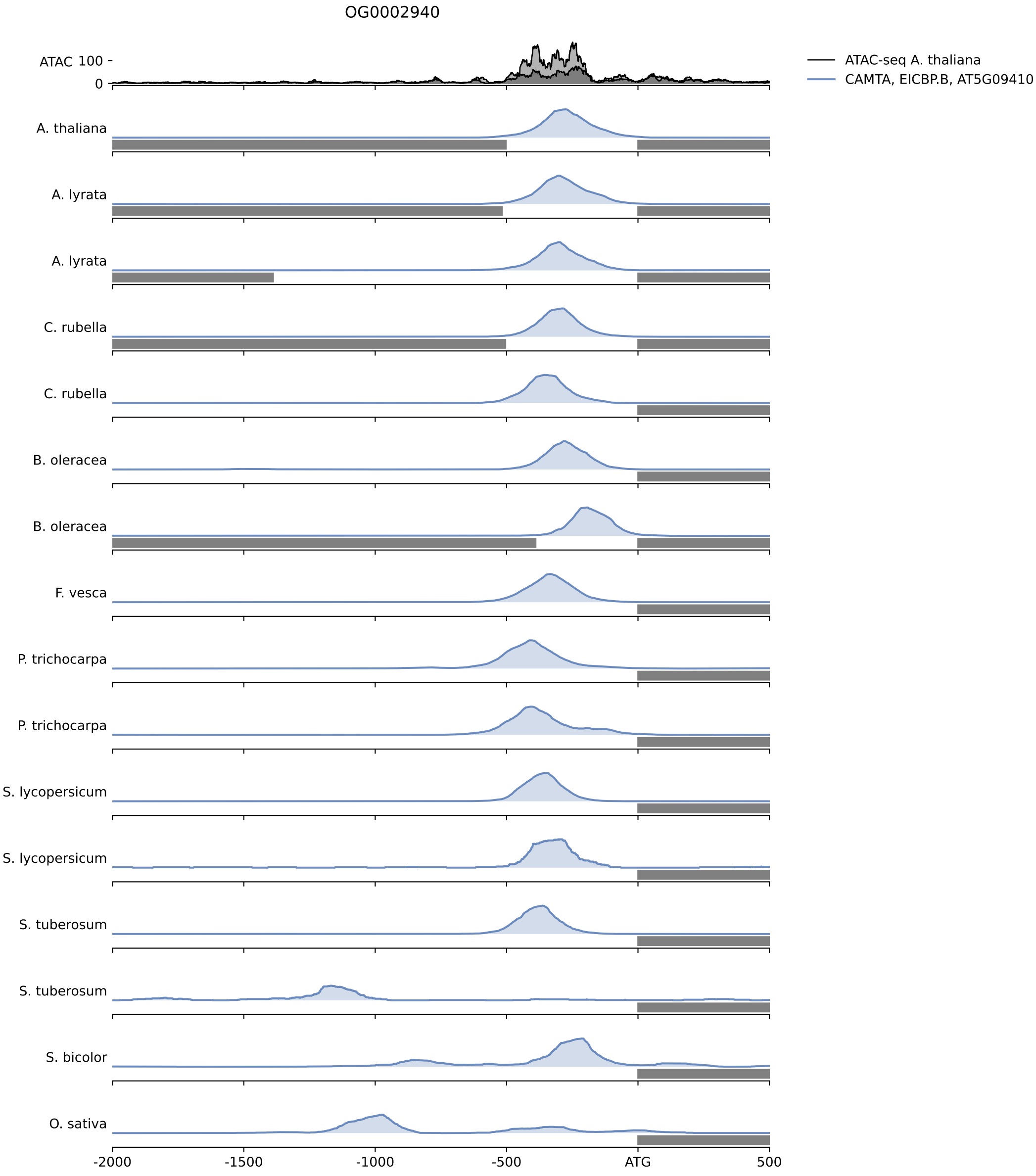
A. thaliana target: AT2G48140, EDA4, Bifunctional inhibitor/lipid-transfer protein/seed storage 2S albumin superfamily protein;(source:Araport11)

A. thaliana target: AT1G05450, Encodes a Protease inhibitor/seed storage/LTP family protein

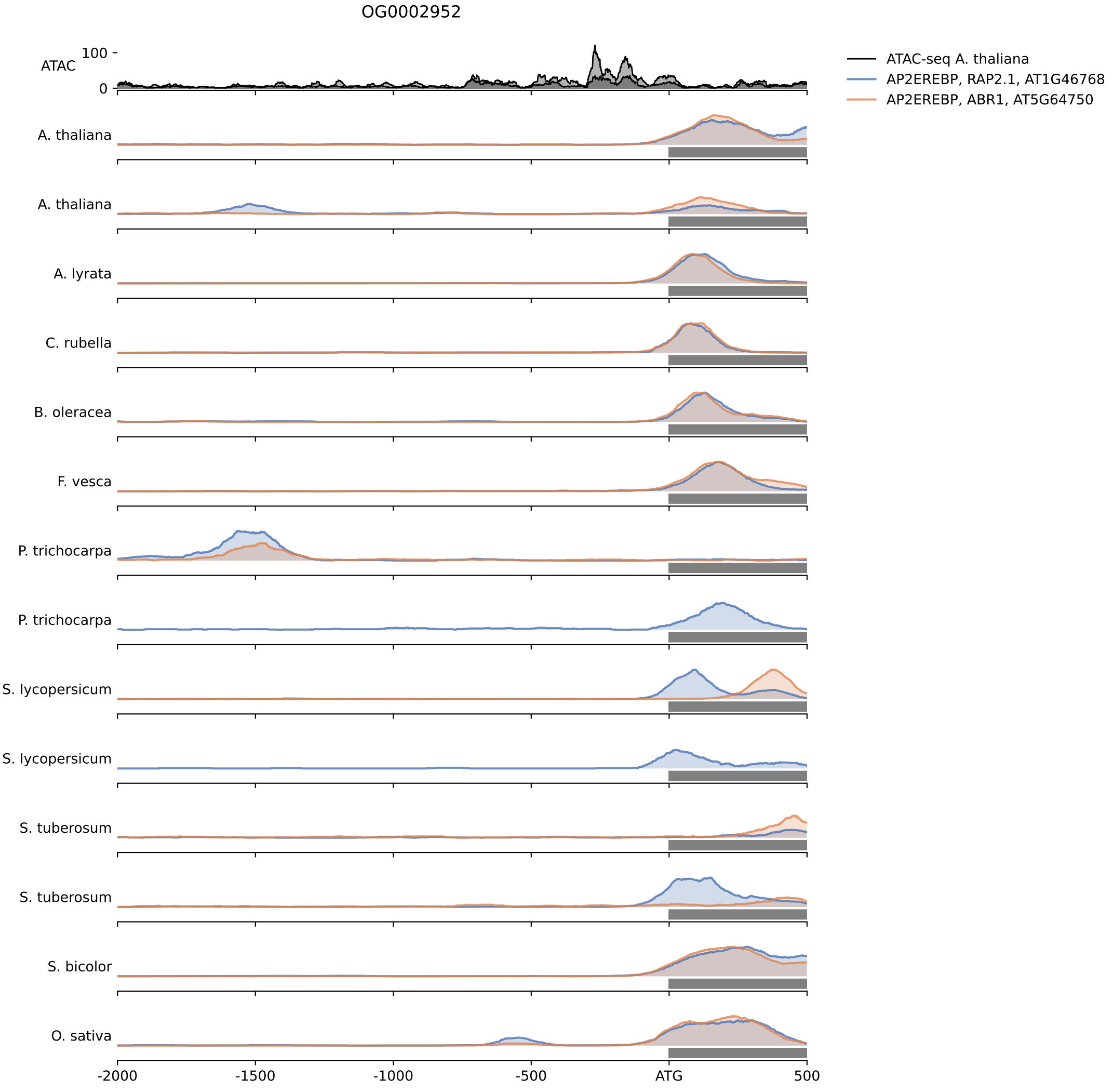


A. thaliana target: AT4G33040, Encodes a member of the CC-type glutaredoxin (ROXY) family that has been shown to interact with the transcription factor TGA2.

A. thaliana target: AT5G11930, Encodes a member of the CC-type glutaredoxin (ROXY) family that has been shown to interact with the transcription factor TGA2.

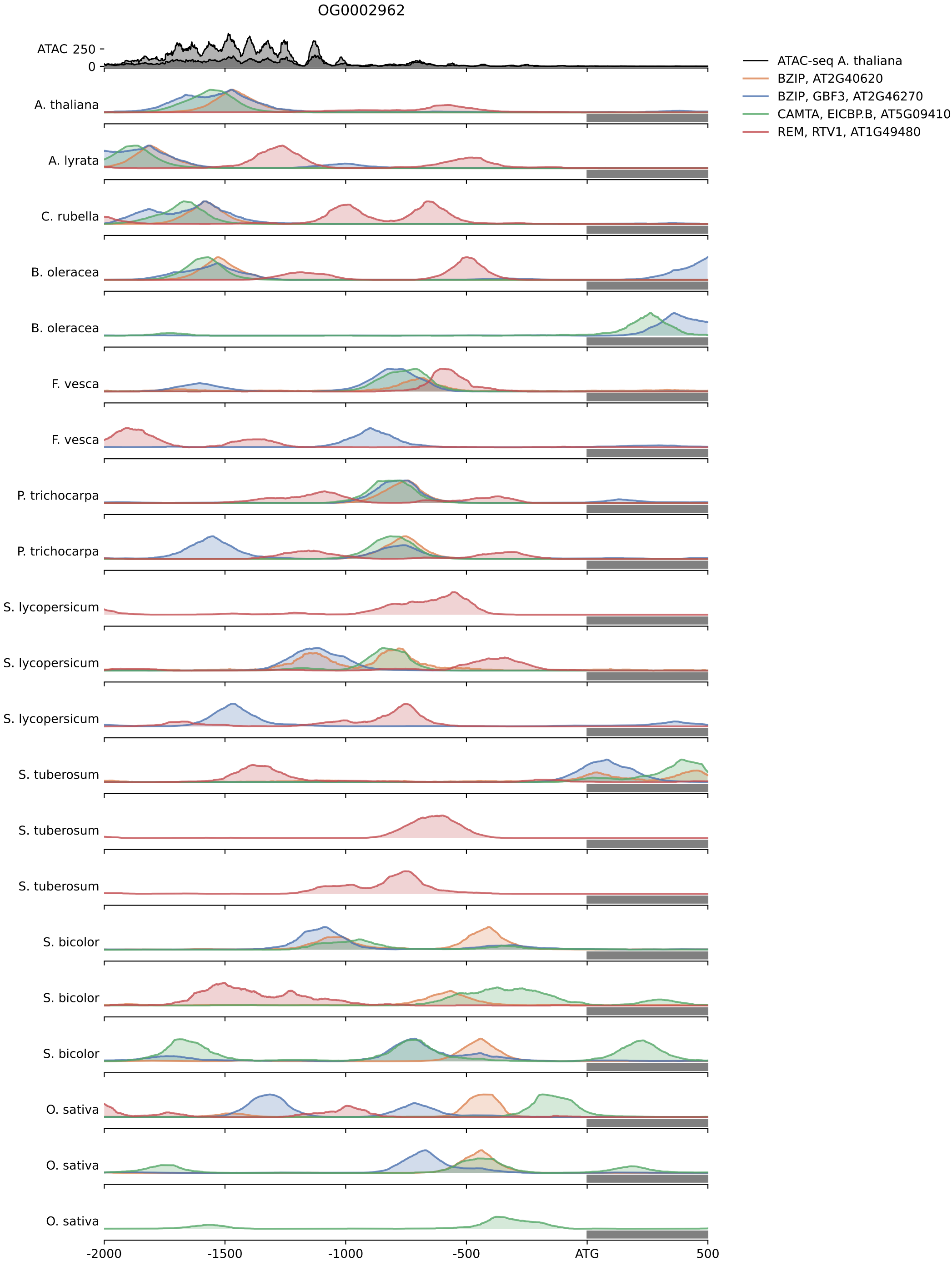


A. thaliana target: AT5G23090, NF-YB13, nuclear factor Y, subunit B13;(source:Araport11)

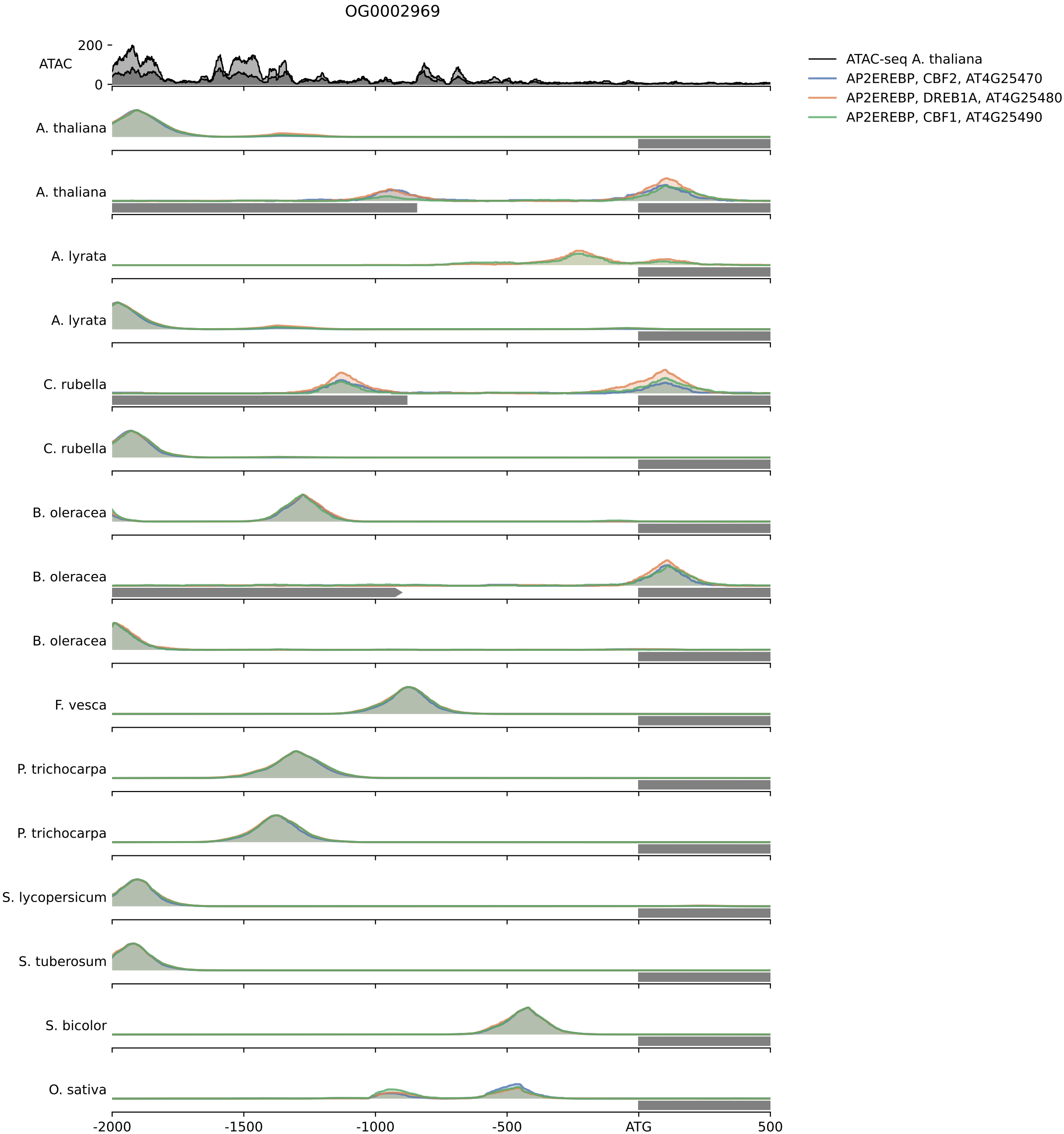


A. thaliana target: AT1G31290, AGO3, ARGONAUTE 3;(source:Araport11)

A. thaliana target: AT1G31280, AGO2, Encodes Argonaute gene that binds viral siRNAs and is involved in antiviral defense response. Regulates innate immunity.Mutants have increased susceptibility to Potato virus X and tobacco rattle virus.

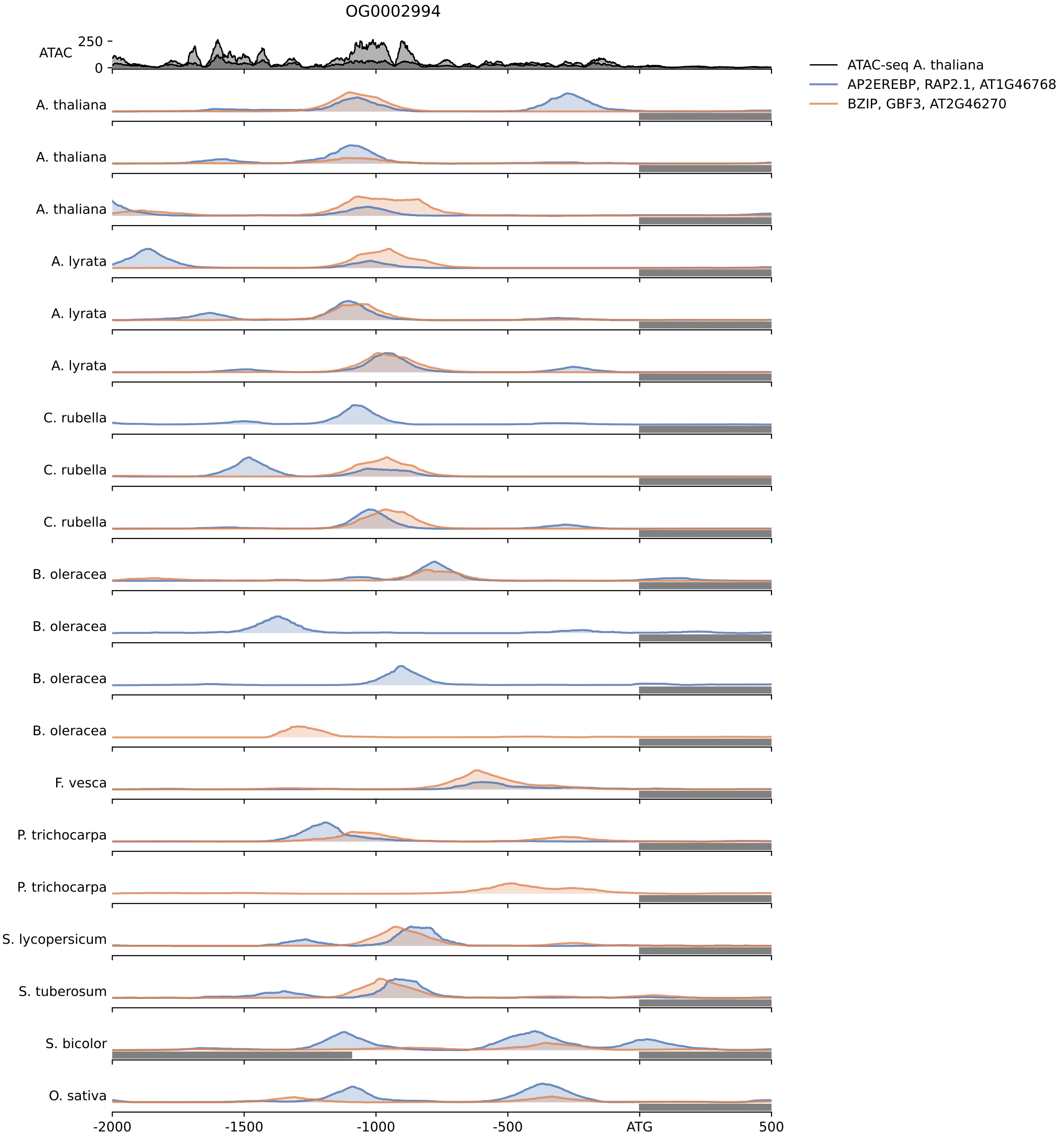


A. thaliana target: AT1G06410, TPS7, Encodes an enzyme putatively involved in trehalose biosynthesis. Though the protein has both trehalose-6-phosphate synthase (TPS)-like and trehalose-6-phosphate phosphatase (TPP)-like domains, neither activity has been detected in enzymatic assays nor has the protein been able to complement yeast TPS or TPP mutants.



A. thaliana target: AT1G27910, PUB45, Encodes a protein containing a UND, a U-box, and an ARM domain. This protein has E3 ubiquitin ligase activity based on in vitro assays.

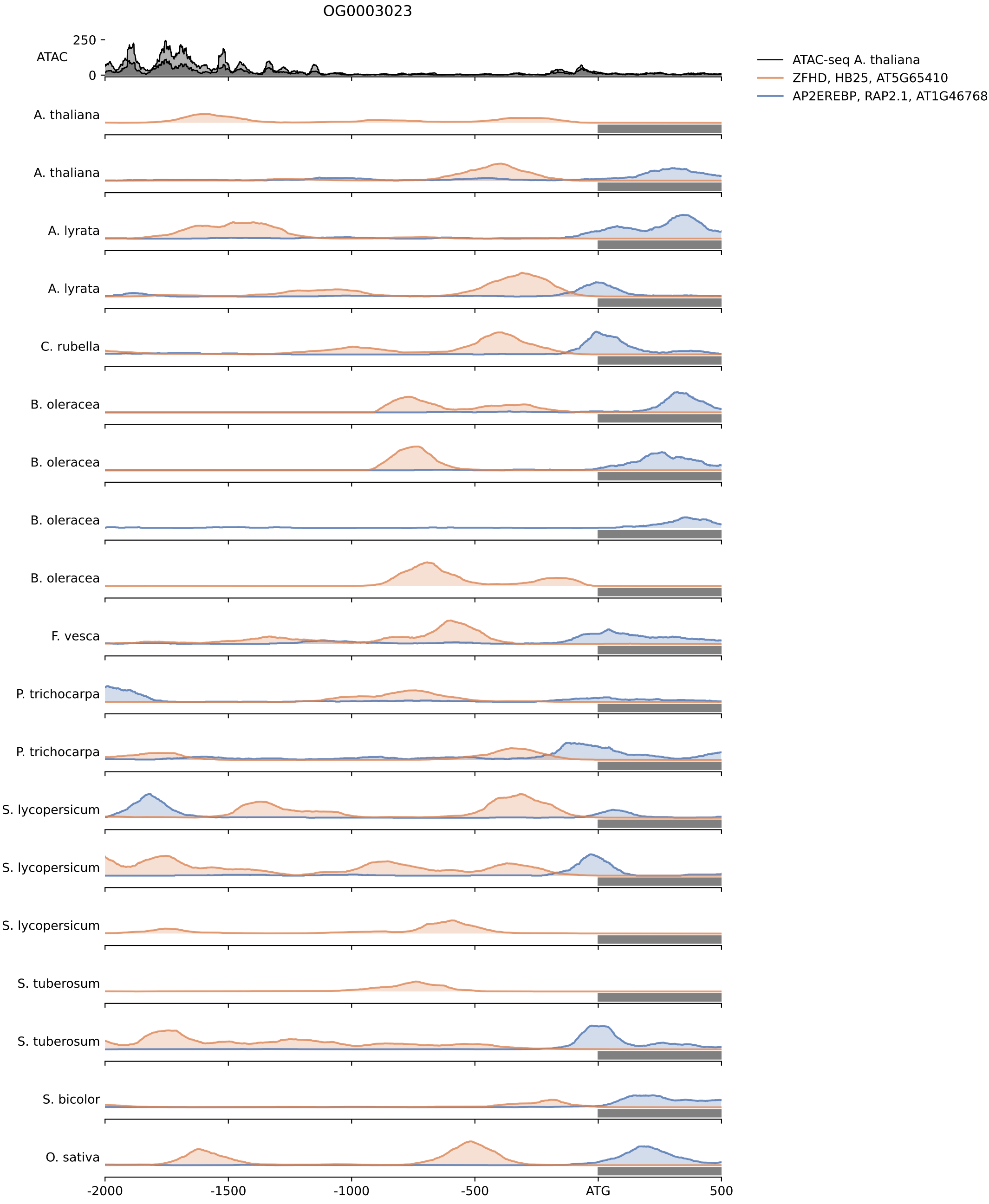
A. thaliana target: AT1G24330, Plant U-box type E3 ubiquitin ligase (PUB).



A. thaliana target: AT1G20450, ERD10, Encodes a gene induced by low temperature and dehydration. Inhibits e.coli growth while overexpressed. Belongs to the dehydrin protein family, which contains highly conserved stretches of 7-17 residues that are repetitively scattered in their sequences, the K-, S-, Y- and lysine rich segments. LTI29 and LTI30 double overexpressors confer cold tolerance. Localized to membranes and cytoplasm.

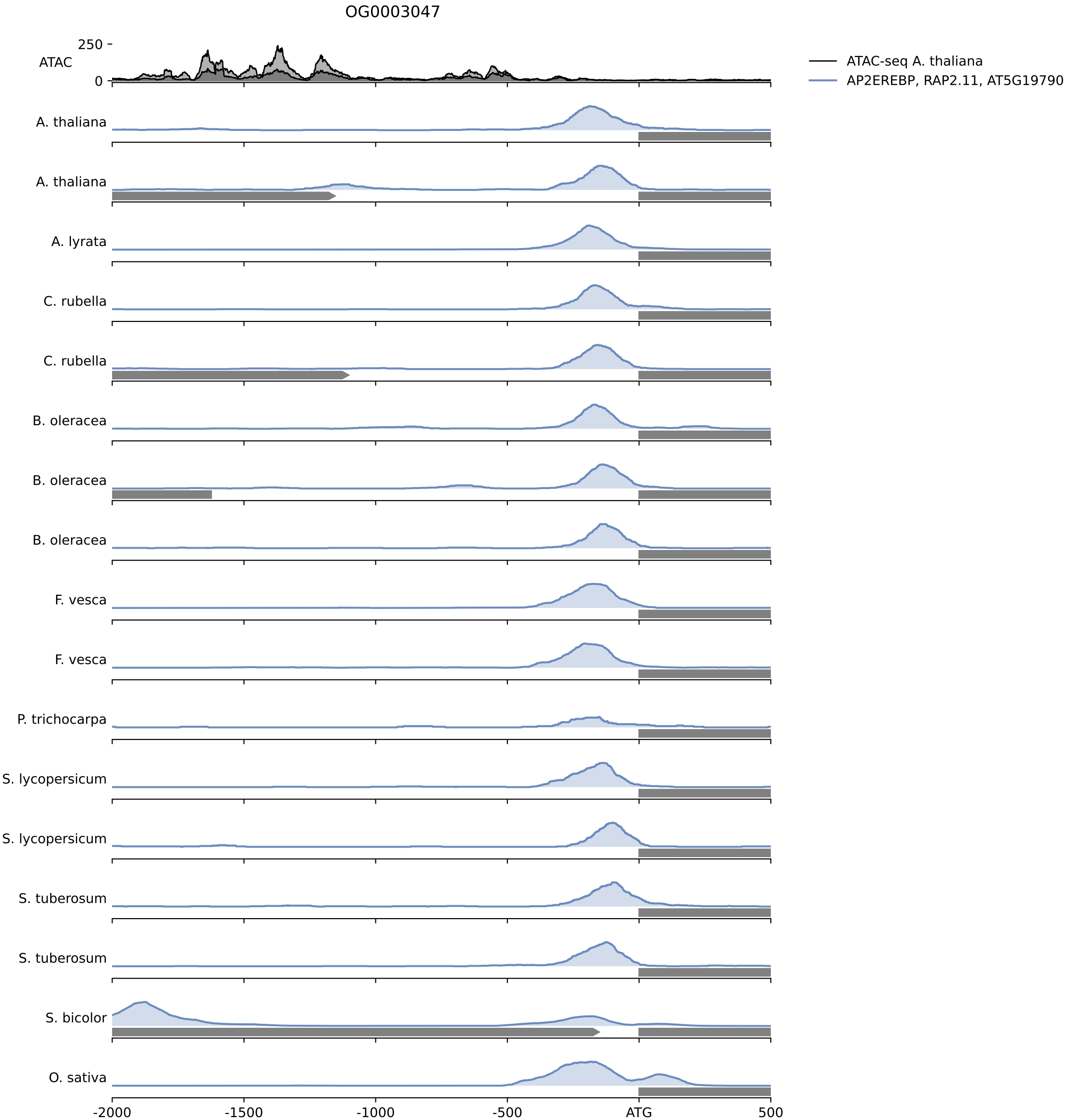
A. thaliana target: AT1G20440, COR47, Belongs to the dehydrin protein family, which contains highly conserved stretches of 7-17 residues that are repetitively scattered in their sequences, the K-, S-, Y- and lysine rich segments. Cold regulated gene, amino acid sequence homology with Group II LEA (late embryogenesis abundant) proteins. Also responds to osmotic stress, ABA, dehydration and inhibits e.coli growth while overexpressed. COR47 and RAB18 double overexpressor plants are cold tolerant. Regulated by heat shock.

A. thaliana target: AT1G76180, ERD14, Encodes a dehydrin protein whose expression is induced early on in response to dehydration stress. This gene's expression to cold occurs in two waves, with early induction occurring within 1 h and secondary induction occurring 5 h after the beginning of cold stress. Expression is also induced in response to ABA but not in response to 2,4-D, BA, and GA3. ERD14 protein is capable of binding Ca2+, especially when the protein is phosphorylated.



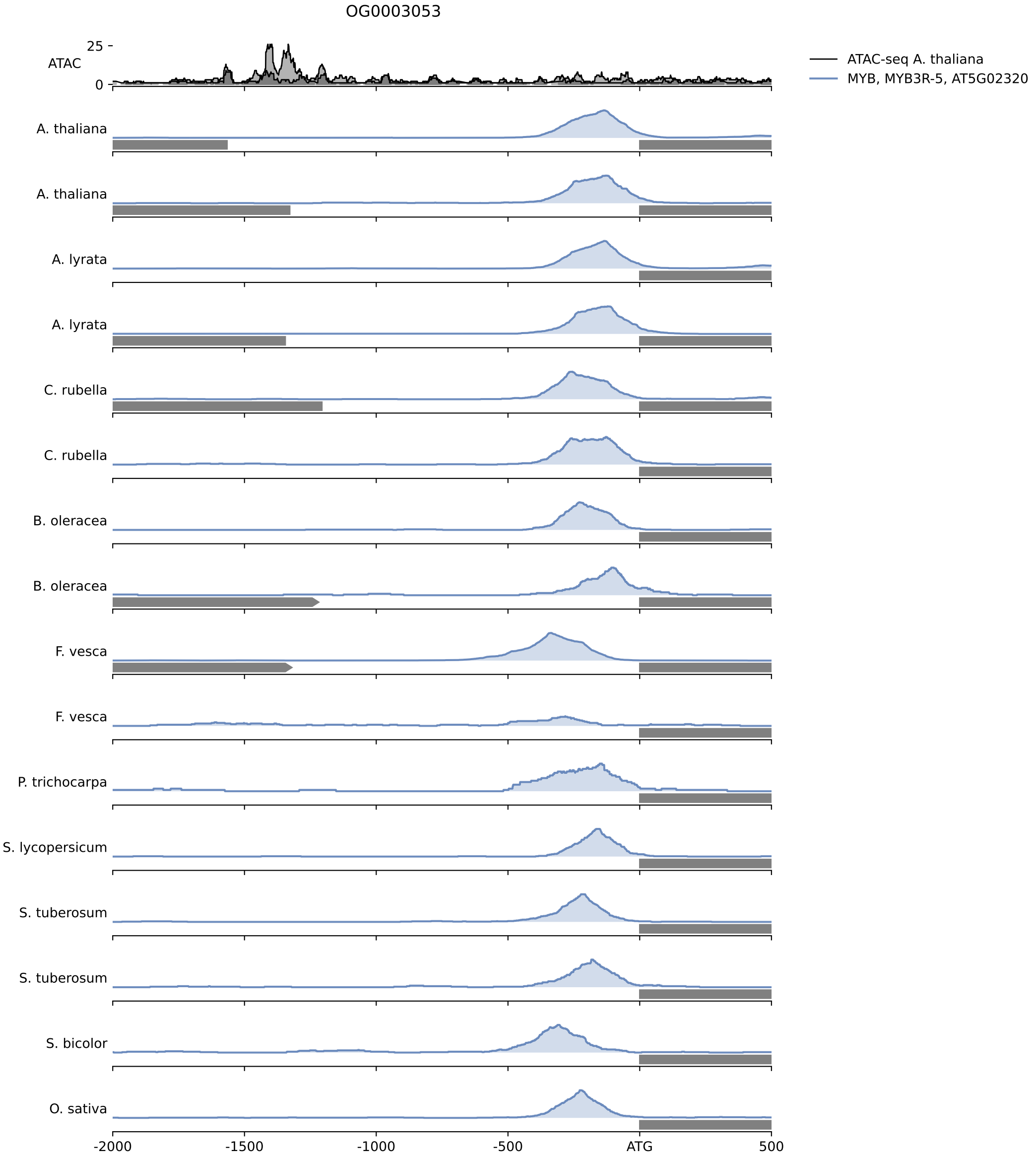
A. thaliana target: AT3G23000, CIPK7, Encodes a serine/threonine protein kinase with similarities to CBL-interacting protein kinases, SNF1 and SOS2. The mRNA is cell-to-cell mobile.

A. thaliana target: AT4G14580, CIPK4, CBL-interacting protein kinase



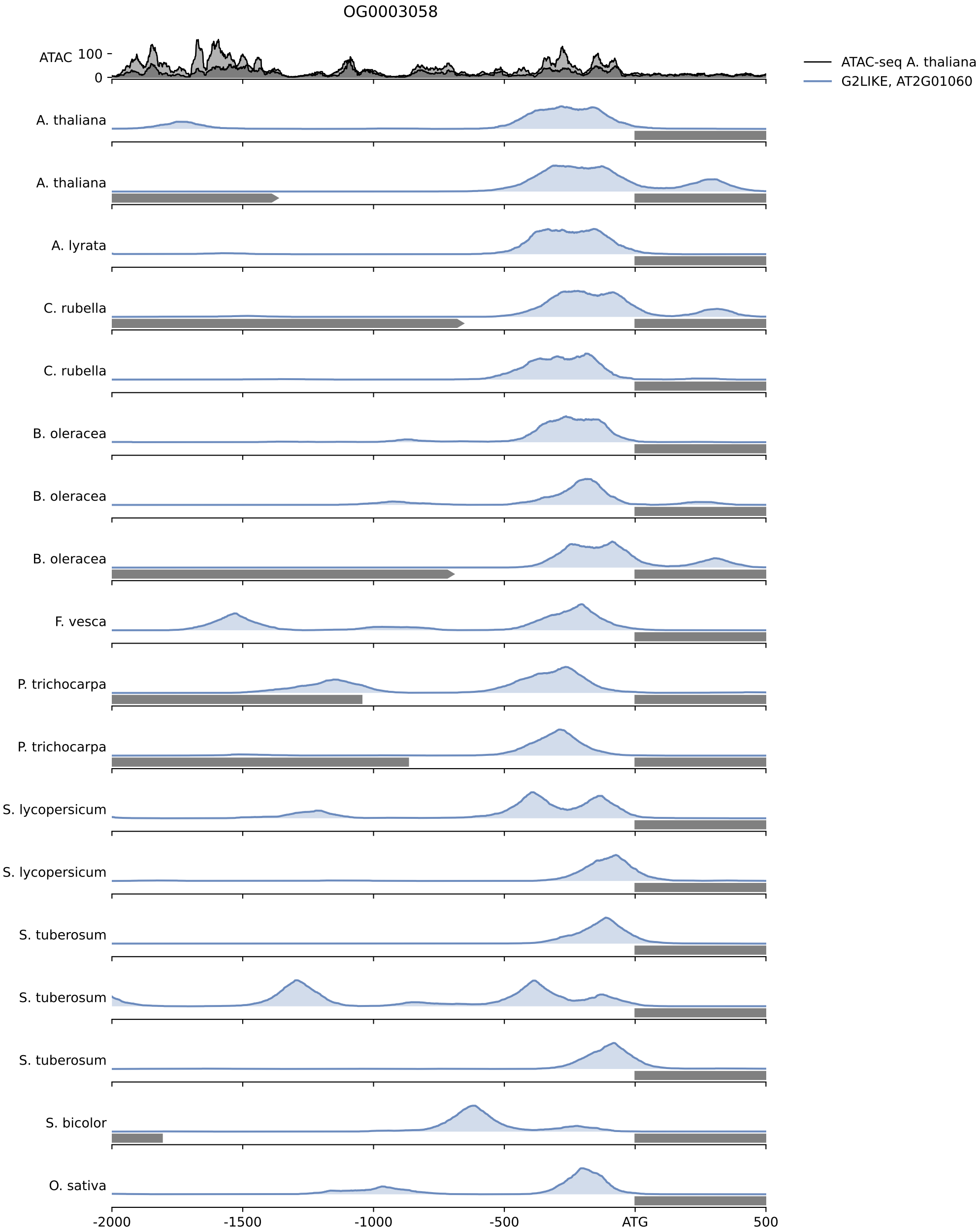
A. thaliana target: AT4G26850, VTC2, Encodes a novel protein involved in ascorbate biosynthesis, which was shown to catalyze the transfer of GMP from GDP-galactose to a variety of hexose-1-phosphate acceptors. Recessive mutation has a reduced amount of vitamin C, lower level of non-photochemical quenching, and reduced rate of conversion of violaxanthin to zeaxanthin in high light.

A. thaliana target: AT5G55120, VTC5, Encodes a GDP-L-galactose phosphorylase, with similar biochemical properties as VTC2.



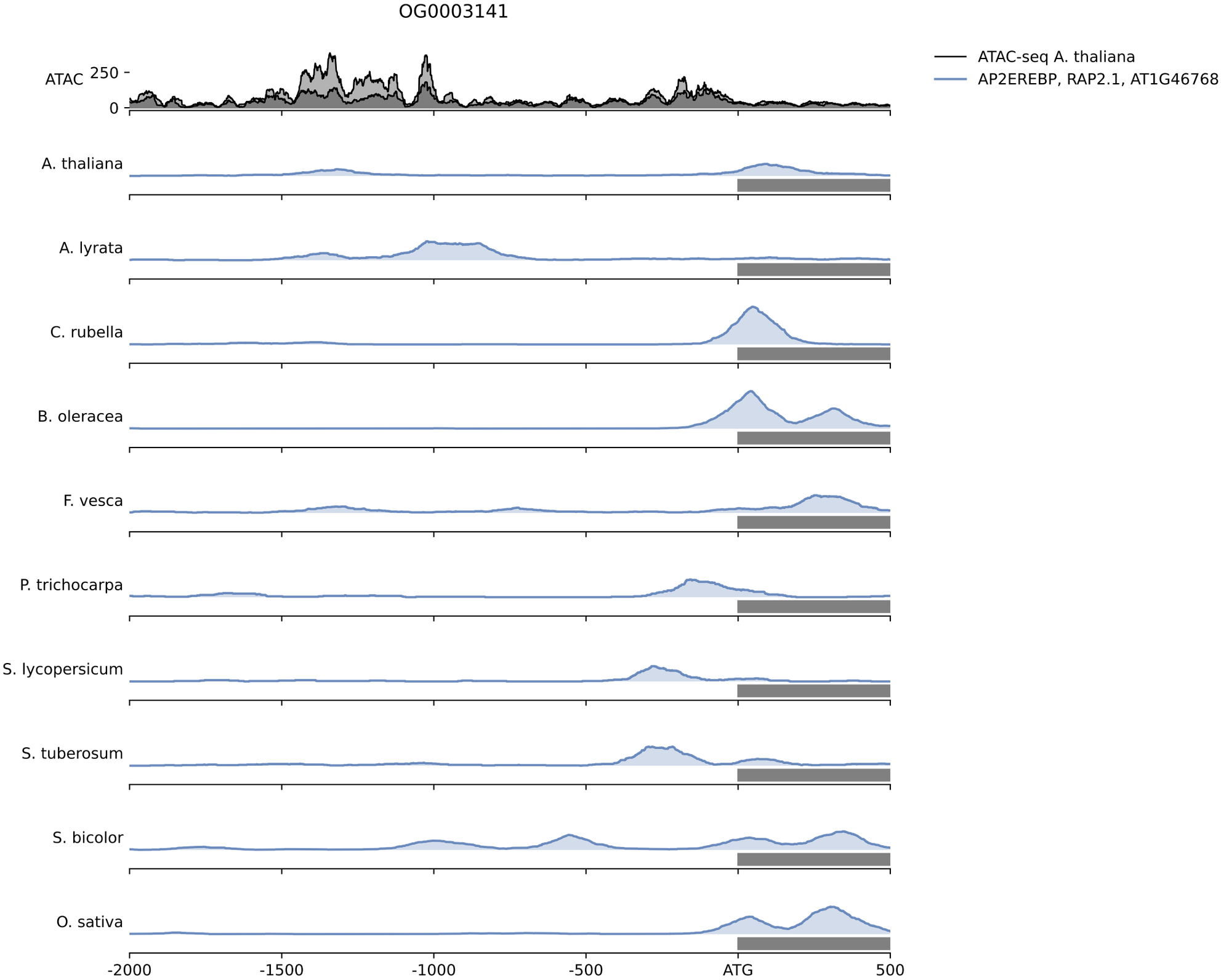
A. thaliana target: AT4G32490, ENODL4, early nodulin-like protein 4;(source:Araport11)

A. thaliana target: AT4G28365, ENODL3, early nodulin-like protein 3;(source:Araport11)



A. thaliana target: AT3G07350, Phosphorus (P) stress-inducible DUF506 gene family member.

A. thaliana target: AT3G25240, sulfate/thiosulfate import ATP-binding protein, putative (DUF506);(source:Araport11)



A. thaliana target: AT3G48360, BT2, Encodes a protein (BT2) that is an essential component of the TAC1-mediated telomerase activation pathway. Acts redundantly with BT3 and BT1 during female gametophyte development and with BT3 during male gametophyte development. BT2 also mediates multiple responses to nutrients, stresses, and hormones.