**Figure 1. Transcriptome rhythmicity under alternating light/dark cycles and identification of *bona fide* circadian genes including free running conditions.** **(A)** Venn diagram comparing rhythmic genes under long day (LD, 16h light / 8h dark) condition (light blue circle) and short day (SD, 8h light / 16h dark) condition (light red circle). Genes exhibiting rhythmic expression patterns are almost identical under both photoperiodic entrainments. **(B)** Boxplot representing the maximum expression level of rhythmic genes (light green) and non-rhythmic genes (dark green). Medians are represented by central horizontal lines, upper and lower quartiles by boxes, minimum and maximum values by whisker ends. Rhythmic genes present significant maximum expression levels three times greater than non-rhythmic genes according to a p-value of 1.45 × 10-4 computed using Mann-Whitney-Wilcoxon test. Gene expression levels are measured as FPKM (Fragments Per Kilobase of transcript per Million fragments mapped). **(C)** Barplot representing with blue colors different rhythmic gene sets under LD conditions. From bottom to top: circadian genes exhibiting rhythmicity under LD, constant light (LL) and constant dark (DD); rhythmic genes under LD and DD requiring a dark input; rhythmic genes under LD and LL requiring a light input; rhythmic genes only under LD requiring the alternation of light/dark periods and non-rythmic genes. **(D)** Gene expression profiles under LD, LL and DD of *DNA polymerase alpha subunit B* (*ostta11g01400*, *POLA2*). White rectangles represent photoperiods (light periods or days), blue filled rectangles correspond to skotoperiods under LD (dark periods or nights), light blue rectangles mark subjective days or nights under LL and DD respectively after LD entrainment. ZTN, Zeitgeber time N, marks the time point N hours after dawn (lights on, ZT0). *POLA2* illustrates that specific genes involved in DNA replication require light maintaining rhythmicity under LL whereas being strongly repressed under DD. **(E)**  Barplot representing with red colors different rhythmic gene sets under SD conditions. From bottom to top: circadian genes exhibiting rhythmicity under SD, LL and DD; rhythmic genes under SD and DD requiring a dark input; rhythmic genes under SD and LL requiring a light input; rhythmic genes only under SD requiring the alternation of light/dark periods and non-rhythmic genes. **(F)** Gene expression profiles under SD, LL and DD of *Ribosomal protein L7Ae* (*ostta02g01210*, *RPL7AE*). White rectangles represent photoperiods (light periods or days), red filled rectangles correspond to skotoperiods under SD (dark periods or nights), light red rectangles mark subjective days or nights under LL and DD respectively after SD entrainment. *RPL7AE* illustrates that specific genes involved in translation require dark maintaining rhythmicity under DD whereas presenting flat expression levels under LL. **(G)** Venn diagram comparing circadian genes identified after LD entrainment (blue circle) and after SD entrainment (red circle). Only a reduced number of genes are identified as *bona fide* circadian maintaining rhythmicity under the free running conditions LL and DD after both LD and SD entrainments. **(H)** Tree-map summarizing the biological processes significantly enriched over the *bona fide* circadian genes or rhythmic genes under LD, SD, LL and DD. Rectangle sizes represent significance levels. Semantically similar biological processes are grouped together into the same colored rectangles. The most representative biological process is shown for each rectangle. **(I)** Gene expression profiles under LD, SD, LL and DD of *RuBisCO Activase* (*ostta04g02510*, *RCA*) exemplifying that *bona fide* circadian genes that maintain rhythmicity under light/dark cycles as well as free running conditions are involved in photosynthesis related processes.