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ENERGY BALANCE AND CO₂ EXCHANGE BEHAVIOUR IN SUB-TROPICAL YOUNG PINE (*Pinus roxburghii*) PLANTATION

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Abstract. A study was conducted to understand the seasonal and annual energy balance behaviour of young and growing sub-tropical chir pine (*Pinus roxburghii*) plantation of eight years age in the Doon valley, India and its coupling with CO₂ exchange. The seasonal cycle of dekadal daytime latent heat fluxes mostly followed net radiation cycle with two minima and range between 50– 200 Wm⁻² but differed from the latter during the period when soil wetness and cloudiness were not coupled. Dekadal evaporative fraction closely followed the seasonal dryness-wetness cycle thus minimizing the effect of wind on energy partitioning as compared to diurnal variation. Daytime latent heat fluxes were found to have linear relationship with canopy net assimilation rate ($Y = 0.023X + 0.171$, $R^2 = 0.80$) though nonlinearity exists between canopy latent heat flux and hourly net CO₂ assimilation rate. Night-time plant respiration was found to have linear relationship ($Y = 0.088 + 1.736$, $R^2 = 0.72$) with night-time average vapour pressure deficit (VPD). Daily average soil respiration was found to be non-linearly correlated to average soil temperatures ($Y = -0.034X^2 + 1.676X - 5.382$, $R^2 = 0.63$) The coupled use of empirical models, seasonal energy fluxes and associated parameters would be useful to annual water and carbon accounting in subtropical pine ecosystem of India in the absence high-response eddy covariance tower.

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