Figure 4. Correlation plots for 5000 randomly generated wind turbine layouts for Case I.

The general trends of the correlation plots for Case II are very similar. Correlations between AEP versus theoretical total wind speed (0.97), and theoretical total wind speed versus total wind speed proxy (0.95) are still very strong. Nonetheless, there is a slight decrease between AEP vs total wind speed proxy (down to −0.85 from −0.88 previously), as the spread for middle velocity values is larger. The linear relation is deemed as satisfactory enough to carry on with the application of model of Eq. (23) with objective function Eq. (24).

The very strong linear relation between AEP and the theoretical total wind speed (0.96) is observed also for Case III, prompting to a very interesting conclusion. Although almost all research in the WFLO space focuses strictly on power modelling (which brings a great deal of complexity due to the non-linear and non-differentiable properties of WT power curve), using an exact model for determining total wind speed as objective function alleviates the computational complexity, while finding high-quality solutions in terms of AEP. However, one should note that deterioration in the correlation still exists, potentially leading to lower quality results.

Likewise, correlations stemming from the proxy to calculate total wind speed deficit are lowered in Case III. This is the case for both with the total wind speed theoretical (0.88) and the AEP (−0.72). Keep in mind that the reason to formulate such approximation is to fit in the context of integer programming to leverage theory and state-of-the-art algorithms of this