Abstract: The parameterization of radiative transfer is a part of numerical weather prediction and general circulation models that is both essential and computationally very expensive, and is therefore subject to never-ending compromises between accuracy and computational cost. The present thesis offers an improvement to the existing broadband radiation scheme by revising its critical components – gaseous transmissions, cloud optical properties, and calculation of internal longwave exchanges. The accuracy of the full-spectrum broadband approach is thus raised to the level required for the short range numerical weather forecast. The intermittent update of broadband gaseous transmissions is introduced as a new component, reducing computational cost while preserving the full cloud-radiation interaction. The scalability of longwave computations is ensured by adopting the net exchanged rate decomposition with bracketing, improved by an intermittently applied self-learning algorithm determining the interpolation weights. It has been demonstrated that under conditions of operational weather forecasting, this developed scheme is fully competitive with the mainstream approach, due to the improved error balance between the stand-alone radiation scheme and the intermittency strategy.