We sincerely thank you for the constructive criticisms and valuable comments, which will be of great help in revising the manuscript. Please find below the detailed reply to the comments in https://www.nat-hazards-earth-syst-sci-discuss.net/nhess-2018-94/nhess-2018-94-RC2-supplement.pdf .

*- Pag.2 (Introduction): note that the ITU-R recommendations that are cited must be updated with ITU-R 618-13, 2017 and 837-7, 2017. As concerning the recommendation ITU-R 618, which is further cited and adopted in the work, please check that the results are in line with the last recommendation 618-13, 2017 (e.g., the CCM results presented in section 4.1.3).*

References to ITU recommendations will be updated.

*- Par. 2.1.1 (Beacon data): which is the precise frequency of Ka band signal of the Astra 3B satellite?*

The Ka band attenuation observations used in the paper measure the 20 GHz beacon of the Astra 3B Satellite.

*-Please specify which is the total period over which the PEARP model is run: it should be over the years 2014 and 2015 (where the beacon measurements are available) but this detail should be explicated in this paragraph to give a complete presentation of the set-up of the adopted weather forecast model.*
*o The lead time of the weather forecast is not specified: since the ensemble forecast F includes 70 members per day (35 computed at 06.00 UTC and 35 computed at 18.00 UTC), I guess that the we are dealing with daily weather forecast (i.e., 70 members per each day of the forecasted period) but it should be better clarified.*
*o It is not clear if the PEARP members are time-series, over a certain period, of the rain accumulated every 3 hours: please, clarify this point.*
*o Please write explicitly in this paragraph that the time resolution of the weather forecast is 3 hours (which is the availability of the forecasted cumulated rain).*
*o Line 11, "Both lagged runs are used together": please clarify this sentence.*

The complementary distribution function of attenuation conditioned to the PEARP forecasts is computed from the daily PEARP forecasts archived in 2014 and 2015. We use together 36h forecast run at 1800UTC day D together with 24h forecasts run at 0600 UTC D+1.  The 35 members of both runs, respectively 06.00 UTC and 18.00 UTC, have been used indiscriminately (we say that runs are used together). Only three hours cumulative rain rate forecasted are available and are used to predict attenuation a finer time resolution…. These points will be clarified in the paper.

*-How is it computed the complementary cumulative distribution of attenuation conditioned to the PEARP classes (the right probability of eq.1)? The probability that A>A* (from the beacon measurements) is combined with the condition on PEARP classes but the procedure is not clear: measurements averaged over 5-minutes are compared with model outputs available every 3-hours.*

The temporal dynamics of attenuation due to rain is high. It would not make sense to average rain attenuation data on a 3-hour basis. Furthermore, this would dramatically reduce the size of the training dataset used to compute the complementary distribution function of attenuation conditioned to the PEARP forecasts. The strategy adopted here consists of building a contingency table between the rain attenuation measurements available every 5 minutes and the PEARP forecasts available every 3 hours. For that, each PEARP forecast is duplicated 36 times (because there is 36 times 5 minutes in three hours). The contingency table allows computing the probability of exceeding, in average during 5 minutes, a given attenuation threshold knowing the PEARP forecasts computed on the same period of reference. The present approach of statistical calibration could be understood as a space AND time downscaling as well.

*-Pag.7, line 8, "This methodology is equivalent to averaging the 70 rain attenuation distributions": this is true for a certain time horizon. It is not clear if the equation (1) is computed per each day of the simulated period (2014-2015).*
In part 2, a methodology to compute the probability of exceeding a given attenuation threshold from a unique value of predicting rain amount is proposed. Nonetheless, the PEARP forecasts are composed of 70 members (35 from each run). In an operational context, the translation of PEARP forecasts into attenuation forecasts will then result in 70-attenuation distributions. Equation 1 consists in averaging theses 70 attenuation distribution, along the probability axis, in order to obtain a unique predictive attenuation distribution.

*-Concerning this section 2.2 and the applicability of the equation (1), some clarifications should be done. If I understood right, the available beacon measurements, combined with the forecasts (computed within the same period of measurements), are used to compute the probability $P(A>A^*|F \in ci)$. Once this probability is computed, it is stored such a "library" available in the operative context. When the satellite communication must be designed, a new forecast is produced for the target satellite-to-Earth transmission period. This forecast is used to compute $P(F \in ci)$ that, together with the probability in the library, allows the computation of the total probability in eq. (1).*

Thank you for the above reformulation which is perfectly correct and will improve the paper.

*-Fig.5: why do a horizontal and a vertical line represent the climatological probability?*

The reliability diagram shows the observed frequencies of an event as a function of its forecast probability. The diagonal line indicates the perfect reliability. It is conventional to represent the climatological probabilities of the event in the forecasts by the vertical line and in the observations by the horizontal line.

*-Please clarify which is the rationale of the rank diagram.*

In the case of an ensemble prediction system, the rank histogram of the position of the verifying observation with respect to the predicted ensemble values provides a measure of reliability (Talagrand et al. 1999). When the ensemble is reliable, say the verification and the evaluated system are from the same distribution the diagram is flat. If the diagram follows a U-like shape then the observation is often outside the ensemble suggesting the ensemble is underdispersive…

*-Fig.7: please check the block diagram, I guess that the (TN) and (FN) boxes should be inverted. Please check the consistency between the symbols used in diagram and the ones used in the equations (2) and (3): TP should be used instead of TD.*

Thank you for pointing that out. This will be corrected.

*- Pag.12: Please give a definition of Fth and explain how is it chosen. o Pag.13, lines 8-9: please clarify the sentence.*

Fth the is threshold from which the predictive probability of exceeding a given attenuation threshold is considered significant enough for establishing protectives measures (for example to reduce the link capacity). In the simplest case, it is the mean when the costs of False Alarms are in the same order of magnitude of the non-detection's one. Fth can be deduce from the ROC curves. The optimal Fth is then the one given by the left and uppermost point of the curve (each point of the ROC curve correspond to a predefined Fth value). ROC curves are useful tools but only allow addressing economic problems presenting cost loss ratios close to 1. Otherwise, the strategy to adopt consists in finding the value of Fth that maximize a predetermined economic value. Fth will be harmonized with the variable Dth defined in 4.1.4

*-Par. 4.1.2 (Transmission strategies): the deterministic scenario is not described.*

The first scenario is deterministic: the real attenuation is known and the MCS are chosen in real time as a function of the current propagation conditions. This is referred as the ACM strategy. However, is it true that the deterministic forecasts used for the simulation of a PCM-D strategy (scenario n ° 4) are not described. The first member of the PEARP ensemble, called the control member is arbitrarily chosen as the deterministic forecast. Then, for the PCM-D strategy simulation, only the first member of the PEARP ensemble has been considered in the training process and in the test process.

*-How was computed the "Mean" capacity of the different scenarios?*

Satellite operators usually set the target link availability to 99.9% of the total transmission time. The methodology proposed in part 2 is used to compute, every 3 hours, the attenuation threshold Ath that, within a probability of 99.9%, will not be exceeded. The estimation of these attenuations allows programming a plan of MCS for all the simulation period (2014-2015) that will ensure the required availability. Table 3 gives the achievable capacity as a function of the MCS applied. The mean capacity is obtained averaging the time series of capacity thus obtained.

*-Pag.17, lines 8-10: please add some details*

The Fig. 9 shows the mean capacities offered by the ACM, CCM and PCM strategies. In order to assess the interest of using probabilistic forecasts over deterministic ones, the PCM strategy has also been tested by using the control PEARP member only. This strategy is referred as the PCM-D strategy.

*-It is not clear the meaning of Dth: in line 32 (pag.18) is defined as a threshold on the forecast probability but in Line 1 (pag.19) it seems to be a threshold on the attenuation. Pag.19, line 2: is it Ath or Dth?*

Thank you for pointing that out. Dth is the threshold of forecast probability from which the data storage must be preferred to the data transmission. Page 19, line 2, Ath is correct. However, page 19-line 1, Dth shall be replace by Ath.

*- Pag.19, eq. (4): please add a reference for the equation (4) and clarify L (I guess it is total lost data over total transmitted data).*

L is in fact the fraction of lost data over the total transmitted data.

*- Fig.10: why is the y axis a "mean" value? Is it averaged over the 2 years (2014-2015) of simulations and Measurements?*

In fact, the economic value is average over the period of reference of the simulation (2014-2015).

*o Pag.20, line 4: please explain better.*

The fig. 10 tells us that, for an attenuation threshold of 1.0 dB, the optimal decision threshold is 0.24 %. The ROC curves (fig. 8) indicates a decision threshold comprise between 0.7 and 1.4 %. This difference of appreciation is because the cost of misdetection is largely superior to the one of false alarm. The ROC curves do not integrate this information.