

Dear authors,

Thanks for the opportunity to review your paper. First I should offer a disclaimer – I probably don't know enough to do this review fully. When I read your title and abstract (and agreed to review this paper), I misunderstood what you meant by "cooperative observation capability". My own research is about ensuring the interoperability of satellites from a radiometric sense – reviewing the systematic biases between satellite sensors' level 1 radiance or reflectance products, and I assumed that this was the aim of the paper. Furthermore, because I have been under a lot of pressure (my country still has a covid-19 lockdown and my children were not at school), I have only got to this review after the deadline, so I wasn't able to tell the journal in time for them to get a new reviewer.

Furthermore, I tried to access the references, but didn't have access to almost all of them as they are IEEE papers, so again, I am not able to do some background study first.

Nevertheless, I hope you will find my review helpful. If I have misunderstood something, then I apologise. I do not know enough to require any of these changes, but I hope you choose to make some modifications that would help me understand the paper – I think those would also help other people and increase your readership.

Finally – I am somewhat concerned about your interest in moving targets. I agreed to review this paper thinking it was about radiometric Earth Observation (for climate science), I then realised it wasn't but assumed it was for disaster relief. Half way through section 2, I began to realise I might be supporting a military satellite application. I feel EXTREMELY uncomfortable with this – I am a pacifist and refuse to work with the military of any country. I continued because I left it so late to do this review and it is too late for the journal to find another reviewer. Please use your satellites to help humanity, not for spying or to support military attacks (the world has enough problems)!

Abstract and Introduction

If you want to increase your readership, and include people who are not specialists, like me, then you need to introduce your topic more clearly in both the introduction and abstract. It would be helpful to have a simple-language explanation of what you are doing in the introduction – perhaps as a new second paragraph.

Something like:

In order to provide emergency coverage to any location on Earth, it is important to ensure that the correct combination of satellites is used. This requires a system model that can evaluate ...

To continue, you need to explain what decisions you are making. AHP is a decision-making process, so what is the decision? Are you during a disaster deciding which satellites to task to image a site? Are you deciding when setting up new satellites how many you will need to be able to monitor a disaster? Are you choosing between satellites that are already up? Is there a cost-benefit analysis going on here (i.e. which satellites it is worth paying for to ensure that you can always respond to a disaster?)

Please make it clear what the decision is in the introduction – that will make the whole paper easier to understand!

Your second paragraph has phrases that I don't understand. I think the ones in this table are common terms in your field, but don't make sense to someone coming new – my questions are here. It would be helpful to explain this better for a greater range of readers.

The performance evaluation ...	Performance in terms of what? In my world we talk about radiometric accuracy for “performance”, others talk about imaging resolution or contrast. But I think you are meaning something different -
Mission effectiveness evaluation ...	Is this the same as “performance evaluation”?
Mission analysis	??? What are you analysing?
Index system construction	??? What index? What system?
Comprehensive evaluation research	What are you evaluating?
ADC efficiency model	I don't think you've explained what ADC is – I'm guessing not “analogue to digital converter”

There are also two sentences I do not understand at all, and I think you have used the wrong English words, perhaps while translating a concept. These are:

- “the remote sensing satellite systems effectiveness evaluation research has also started from the equipment system” (what “equipment”?) and
- “in which the role of the concrete to the remote sensing satellite ...” I think the word “concrete” is an incorrect translation of something else.

Again, AHP is not a technique I have used before, but having done a little bit of background reading to make this review as helpful as possible, I see that it's used for group decision making. (You may therefore want to describe who the group is during the new second paragraph!). In the last paragraph of the introduction, I think you need to explain what AHP is more clearly. Perhaps start that paragraph (currently line 53) with something like:

AHP is a method for decision making that is widely used, particularly for group decision making in a high-stakes area. AHP helps decision makers choose between options by providing a rational framework for structuring thinking around a decision.

Then you can go onto the “basic principle is...” bit that you have already written. I think, though, that “to achieve the goal of decomposition problems” is too difficult to understand and would be better written like:

The basic principle of AHP is to decompose the problem into different factors and to organise these in a hierarchical clustering combination, to form a hierarchical and ordered “hierarchical structure model”. Each factor is then given a quantitative weight, based on the judgement of multiple decision makers and using mathematical methods to determine relative importance at each level.

Finally, I'm still not sure I understand “remote sensing observation capability” in the last sentence, but your new paragraph earlier in the introduction should help with that.

When you've rewritten the introduction, also consider the abstract. That also needs some simpler sentences that describe the actual question you're attempting to answer.

Finally, I think you use in this paper “observation capability” and “observation ability” interchangeably, and you have indexes, and “the capability” and “indicators” – please use just one phrase for one idea.

Section 2, Evaluation model

The first sentence is missing a word: “In order to evaluate scientifically ...”. The phrase “ability to ascend” is not something I understand. Again, I wonder if “ascend” is used wrongly? The following sentence is repetitive (it says the same thing multiple times) and may be better written something like: “This model is based on an index system, used with a model, to identify the “remote sensing observation ability”. (I’m still not sure what “an index system” is, so if you can explain that, that would be better.

“The actual support effect of synergistic satellite resources” → “The benefit (“support effect”) of any one particular satellite sensor is evaluated by comparing the remote sensing observation ability of the observation system with and without this sensor” (I think – or maybe I have misunderstood, if I have use this sentence model to explain the full picture).

“Through the quantitative comparison...” “By using this quantitative method, the overall system observation capability with different combinations of satellites can be evaluated”

Section 2.1

Again, your first sentence is too technical and too long and is hard to understand. Consider:

The “remote sensing observation capability evaluation model” here needs to consider the capability of observing any point target, any regional target and any moving target. These can be considered independent requirements. Therefore, the observation capability index is decomposed into three second-level indices, namely ...

Line 102: “The measurement indexes mainly include” (you used “indices” rather than “indexes” above, be consistent!). I think this is better written as “This capability is further decomposed into 5 sub indices: ...”

Line 112: What is “the opposite target”?, and line 118, what is “the planar target”? Is it the same as the “opposite target” or is “target” being used to mean two different things here (project goal and specific thing to observe in the disaster zone?)

Line 136: “extensible” – I think you mean “extendable”

Section 2.2

Again, help your readers with an introductory sentence, something like “The next step is to define the weights for each of the indices. This weighting is done through expert judgement with a group of experts, and is based on relative weighting of pairs of indices. Expert terms such as “as important” or “much more important” are weighted in a mathematical way. The priority relationship judgement matrix ...” (or something like that – I am no expert and may have completely misunderstood!)

Is this done for individual experts and then combined? Or is it done for a group discussing together?

I assume the matrix analysis method is standard AHP. It's not a method I've used, so I can't check the equations. I am slightly unsure about the use of the word "fuzzy". Is this used in the formal sense (I've heard of "fuzzy logic" as a topic, but don't know much about it)? If so, I suggest you somewhere use the term "fuzzy logic" – perhaps in the end of the introduction when you introduce the concepts of AHP?

Ah, at (b) (line 170) I realise you are combining values from different experts (for the first time). What is not clear is how you do that. Is there a matrix A for every expert? I thought A had rows/columns that represent each of your sub-indices in the table at line 100 and this gives the matrix of how important each is relative to each other? But now I'm not sure what i and j represent (do different experts come in some how?). Also you introduce $e = 1, \dots, m$ in line 167 and then use m in line 176. Is e "expert number"? If so, should line 176 have the sum over experts using notation e ? And why isn't there an e in equation 1? (Should it be matrix A_e ?) I'm really confused by line 176, what is r ? Consider describing in words as well.

Line 181 – is the e_{ij} here the same as the e in line 167? (Which was a variable used to index matrix components?, but this is a matrix component)

Your notation is very confusing!

Oh, in line 183 we have eigenvalues, is one of these e values an eigenvector and another an expert index?

On line 197 you introduce F_p . What is that? Write it in words too! Is it the "fuzzy judgement matrix" and if so, is that the combined judgement matrix of all the experts? Then you have a P_A in line 205, which again, you haven't defined. Is the equation (1) with matrix A a conceptual example and the F_p and P_A specific examples of that? Please make this clear!

Line 203 and onwards – this is the first time you put in real numbers, but you don't explain where they come from! Ideally, you would write something like:

In this work we were considering the observational capability of a set of satellites for disaster monitoring. We brought together a group of XX people who are directly involved in using satellite data for disaster relief, from YY institutes/government departments. These experts individually evaluated the relative importance of the different indices, and by combining those results, as discussed above, we obtained the following matrices ...

(If you are using military officials, you may not be able to give away a lot of information, of course, but do say something about how many people were involved and that they were experts in the practical application of these satellite sensors – the numbers are meaningless otherwise!)

Section 2.3

Again, help your readers with an introductory sentence, something like:

The next step is to calculate a value for the observation capability using equation (15). For this, each satellite system needs to be given an evaluation score. The conditions for these scores were also chosen by an expert panel.

What's a "leaf node"? (Do you need to use this jargon? If so, please define it)

Table 6

Why were points lost for observations? Surely more observations is good? (Regional target observation capability)?

What is a “maximum revisit time interval” of 0.0001 minute? That’s every 6 ms! And what’s that to do with “1 second” in the same sentence? (Point target) And in what way is this “maximum”? What is “0.1 minutes per second”? Again, that’s weird!

What’s a “whole course” and how does that relate to a moving target? You haven’t used that term before

Earning and losing points, and minutes and seconds – what is this scoring system and what is it out of?

I do not understand the table AT ALL!

Section 3

Now you mention the GF satellites – you really need to explain them much earlier in the paper! Are you trying to choose which GF satellites to use for your application? (What is the decision / comparison? – the score feels meaningless on its own but useful to compare options, so what are the options?) If you are now going to give me some applications of the method – I really think you should have given me those examples earlier in the paper!

Scenario 1 – so you are comparing using just one satellite vs using the full suite of GF satellites? Is this the comparison I’ve been wanting to understand?

What is the “resource satellite” – is that just one satellite? And “satellite synergy” - is that using all of them? So you’re saying that based on expert judgement of importance, using all the GF satellites gives you a 48% improvement over using just one?

(By the way, I don’t think you should give four decimal places, you have made so many assumptions and rounding errors earlier, that this should be 49%, or if you really want to push it 48.9%, everything beyond that is meaningless)

Scenario 2 – this is not really a new scenario, it’s the same scenario (one satellite vs a group of satellites) but now you’re looking at the regional example. I’ve also just realised that you can only do this quantitatively for a very particular region (here your sea area) and it would be completely different for, say, the mountain area to see disastrous landslides!).

Is this a weakness in equation (15) where you combine point, regional and moving targets? That you can’t ask these questions generically, but only for specific regions and moving targets?!

Line 290 – again way too many decimal places! Surely 54% or 53.6%?

Line 291 – what is “belt coverage”? This is another jargon term you have just introduced, as is “strip coverage” on line 294.

Scenario 3 – this seems the most interesting scenario and is different from the previous ones. This is now very specific to a single question, which I think is fine. Again, in line 343 you have far too many decimal places.

Line 349: “only the moving target can be observed intermittently” – do you mean “the moving target can only be observed intermittently”?