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## Comment on amt-2021-365

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Community comment on "Evaluation of aerosol microphysical, optical and radiative properties measured with a multiwavelength photometer" by Yu Zheng et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-365-CC1>, 2021

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### **A new multispectral photometer for monitoring aerosol microphysical, optical, and radiative properties**

**by Zheng et al.**

#### **A. General comments**

The manuscript presents a system for the monitoring of atmospheric aerosols, based on a new instrument. It is mainly based on a comparison with the AERONET system (based on the CE318 photometer), considered as the reference.

The main claims of the authors are

- novelty,
- additional functions,
- validity of metrology,
- validity of data processing chain,
- validity for network operations,
- simplified maintenance,
- low cost.

Having read this paper, I concluded that these claims are not substantiated by scientific and technical evidences:

- No conceptual novelty is shown hence the work appears rather like an approximate duplication of the whole AERONET instrument and system.
- The comparison of CW193 specifications to the reference CE318 system is not complete and not fair:

a) First, this comparison should be done with the current AERONET reference instrument CE318T and not with the old version of CE318 as done in the paper

b) Second, and linked to point a), several important functions present in AERONET are lacking (Lunar measurements, polarized sky radiance option, multiple scenario configurations). Hence, this comparison looks unfair.

c) Third, the claimed benefits of some new features brought by CW193 are not explained nor proven.

- CW193 performances are not characterized nor validated
- Long term performance including robustness, sensitivity to weather conditions is not evaluated, therefore not validated.
- In the paper, the data quality analysis is limited to a few selected measurement days. The evaluation of the system's quality requires a much more comprehensive experimental plan.
- The additional benefits claimed for the improvement of operational observations (robustness, simple maintenance, low cost) are not evidenced.

As conclusion,

- The work presented in the paper does not bring new knowledge to the scientific community, as it would expect.
- It mainly rather makes a series of technical and commercial statements on claimed advantages of CW193 instrument without providing corresponding evidences.
- In summary, these weaknesses and lacks are in opposition/contradiction with the claimed advantages of CW193: *novelty, additional functions, validity of metrology, validity for network operations, simplified maintenance, low cost.*

## **B. Detailed and specific comments**

- Line 83: "wired communication (for example, serial communication via RS-232) between the instruments and a personal computer is still necessary for most CE318-N photometers".

*Comment: This statement is NOT correct. AERONET operates a large number of sites at remote locations without wired communication with a PC.*

- Line 85: "the non-integrated instrument components, such as the control unit, external battery, protection box, and stents platform, not only cause most of the operational problems but also make the deployment and maintenance difficult for staff with inadequate training"

*Comment: This opinion is not justified and does not seem fair.*

*In AERONET, the protection box and simple tripod platform are options that may be very useful for some types of installations, especially in remote places, where trained staff and technical means are not available. The modular design of CE318 is often an advantage in terms of easy replacement of parts.*

- Lines 92-93: "which makes the whole system efficient, secure, low cost and highly integrated."

*Comment: this list of assertions is not justified by the information provided in the paper.*

*The presented integrated design does not allow local control of the instrument without a PC, which may be a major issue in remote locations.*

*The low cost should be quantified, including initial and expected maintenance costs, and spread over the proven expected lifetime of the instrument.*

*Efficiency and security should be quantified over the long term, in terms of uptime of the*

*instrument and proportion of data brought to some defined quality level.*

*AERONET has proven an unmatched efficiency and service level in producing quality assured atmospheric aerosol products over the long term*

- Lines 97-99: these assertions are not justified.
- Line 125: "largest" should be qualified: probably refers to China
- Line 126: "Same algorithm" *should be qualified. How has it been validated?*
- Line 143: *Again, comparison with CE318-N is not relevant as this is an old version of CE318. Most of AERONET sites are equipped with the more recent version CE318-T. The table should be corrected to present a fair comparison.*
- Table 1 - *The whole table 1 should be corrected with CE318-T technical specifications*
- Table 1: *what is the type of detector used?*
- Table 1 - Drift of single band filter's transmission rate < 1% for CW193 :
  - Sun tracking accuracy: 0.02 °
  - Temperature range: -30° to 60°

*The characterization of these performances should be described.*

- Table 1: - Power supply for CW193

*The type and capacity of the battery system should be described.*

*The autonomy of the system, in case of operation on the solar generator and absence of direct sun, should be stated.*

- Table 1: - Gross weight and flycase dimensions are not really relevant, or should be completed with net weight and dimensions, and with all components (solar panel)
- Lines 174-175: "the design of CW193 is very robust, ensuring long-term steady operation in a wide range of temperature and humidity, between about -30°C and 60°C and between about 0 and 100%, respectively"

*Comment: This assertion is not supported by any evidence.*

- Lines 189-192: "It is very convenient to receiving data via 4G network when the serial communication is unavailable in some remote regions, and also in this mode, multiple device control is achievable (device 003, 005 and 006 are on-line and controllable in Figure 3). In the data download part, the history data can be easy downloaded by selecting the start and end time via drop-down menu".

*Comment: This is presented as a new function and an advantage, but the AERONET network already operates a large number of remote sites with direct telecommunication link.*

*In AERONET, full data collection is ensured fully automatically in real time, or even after interruption of communications. This is more convenient than manual control through a software.*

- Table 2 - *The whole table 2 should be corrected with CE318-T functional specifications*
- Line 211: "five instruments"

*Comment: The method and specifics of the calibration of the studied CW193 should be described.*

*For the whole intercomparison study, Sun calibration should be made on a different set of data. Is it the case?*

- Line 313-314: "Therefore, in summary, the CW193 shows high stability under both high and low aerosol loadings; hence, the excellent detection ability makes it a reliable instrument for aerosol monitoring."

*Comment: This conclusion regarding the reliability of the instrument is not justified in the paper.*

- Figure 6:

*Comment: This figure does not show interruption at nighttime. The observation time per day should be explained.*

- Line 352: "We set the envelopes as  $\pm(0.05 + 10\%)$ ."

*Comment: The choice of this criterium should be explained.*

*It is quite large compared to the AERONET uncertainty.*

- Line 412: "uncertainty of  $<10\%$  is acceptable for the discussion"

*Comment: This level of uncertainty is much higher than AERONET's.*

- Lines 568-570

*Comment: This conclusion should be expressed as a preliminary only.*

*It must be checked on long-term and various weather and aerosol conditions.*

- Lines 582-585: "the highly integrated design and smart control performance make CW193 more convenient and suitable for the aerosol monitoring, providing similar aerosol optical properties to AERONET. In addition, owing to the built-in 4G communication module, CW193 could be used to create networks in an inexpensive and simple way."

*Comment: as such, this is a commercial statement, not evidenced by the paper. It should be removed or rephrased.*