ClimApp Virtual Conference 2020

You are welcome to the ClimApp Virtual Conference!
The aim of the conference is to introduce ClimApp to stakeholders, end-users, climate service providers, health authorities, academia, et al. Further aim is to get feedback for fine-tuning ClimApp according to users' needs.

When: 24 September, 2020 9:00am - 10:30am (CET)
Where: Webinar (Microsoft Teams link will be sent after registration)
Registration before September 22.

About the ClimApp project

ClimApp is an ongoing EU project funded by European Research Area for Climate Services (ERA4CS) and three participating countries: Sweden, Denmark and The Netherlands. The aim of this project is to develop an advanced mobile phone App that integrates weather forecast data into human heat balance models. The personalized App takes into account individual factors and predicts body responses, provides health risk warning, and gives advice to individuals in both the public and private sectors. ClimApp supports decision-making when coping with heat and cold stress, especially when facing extreme weather events such as heat waves and cold spells.

Conference programme

Time	Program
09:00 - 09:10	**Introduction to EU ClimApp project** Chuansi Gao, Project Coordinator, Lund University (LU), Sweden
09:10 - 09:25	**Demonstration of ClimApp as a mobile tool** Boris Kingma, Project IT-specialist, University of Copenhagen (KU), Denmark
09:25 - 09:40	**Participants explore the App, and application cases** Hein Daanen, Project Co-PI, Vrije Universiteit Amsterdam (VU), Netherlands
09:40 - 10:10	**Questions and discussions** Moderators: Lars Nybo, Project Co-PI, University of Copenhagen (KU), Denmark Jørn Toftum, Project Co-PI, Technical University of Denmark (DTU), Denmark
10:10 - 10:25	**Questionnaire and feedback** Boris Kingma, Project IT-specialist, University of Copenhagen (KU), Denmark
10:25 - 10:30	**Summary**

Conference materials

Conference presentations (ppt format)

Introduction and ClimApp project
by Chuansi Gao, Lund university, Sweden

Demonstration of ClimApp as a mobile tool
by Boris Kingma, University of Copenhagen, Denmark

Participants explore the App, cases
by Hein Daanen, Vrije Universiteit Amsterdam, Netherlands

Summary
by Chuansi Gao, Lund university, Sweden

Conference presentations (recorded version)

Introduction and ClimApp project Part 1
by Chuansi Gao, Lund University, Sweden

Introduction and ClimApp project Part 2
by Chuansi Gao, Lund University, Sweden

Demonstration of ClimApp as a mobile tool Part 1
by Boris Kingma, University of Copenhagen, Denmark

Demonstration of ClimApp as a mobile tool Part 2
by Boris Kingma, University of Copenhagen, Denmark

Participants explore the App, cases
by Hein Daanen, Vrije Universiteit Amsterdam, Netherlands

Questions & Discussions Part 1
by Lars Nybo, University of Copenhagen and Jørn Toftum,Technical University of Denmark, Denmark

Questions & Discussions Part 2
by Lars Nybo, University of Copenhagen and Jørn Toftum,Technical University of Denmark, Denmark

Questions & Discussions Part 3
by Lars Nybo, University of Copenhagen and Jørn Toftum,Technical University of Denmark, Denmark

Summary

by Chuansi Gao, Lund University, Sweden

Feedback via mentimeter – Result (ppt format)

Feedback via Mentimeter - Result

Questions, comments and answers

Here you can find questions, comments, answers and possibilities for further development during the ClimApp Virtual Conference in 2020.

1. **How do you choose between different sources of short-term weather forecasts, to provide advice to the users?**

The weather forecast data inputs are from open global weather data services through free and easy-to-use Application Programming Interface (API), provided by OpenWeatherMap. OpenWeatherMap uses weather data sources including Global NWP models: NOAA GFS 0.25 and 0.5 grid sizes, NOAA CFS, European Centre for Medium-Range Weather Forecasts (ECMWF), Environment Canada, Japan Meteorological Agency, METAR data from airports, and APRS network.

OpenWeatherMap.org processes and analyses the data, improves the quality and accuracy, and provides open global services.
There are other weather forecast data sources available, but none that are both open access and have an easy-to-use API.

ClimApp uses all relevant thermal climate factors (not just one or two factors) that affect the heat exchange between the human body and the environment. These include air temperature, relative humidity, and wind speed. Solar radiation-related globe temperature and mean radiant temperature are derived and also used in ClimApp.

2. **How do you determine whether someone is "heat acclimatized" or not? Is it self-reported, or based on certain physiological metrics?**

At the moment, heat acclimatized status is self-reported.

Both ISO 7243 and ISO 7933 take the user's acclimatization status into account. In ISO 7243 WBGT limit values for both acclimatized and non-acclimatized users are provided. according to this standard, an acclimatized person is one who has been exposed to the hot working conditions (or similar or more extreme conditions) for at least one full working week immediately prior to the assessment period. If this is not the case, the persons shall be considered to be unacclimatized. In ISO 7933 it is assumed that acclimatized subjects sweat 25% more, and the maximum skin wettedness is 1.0 (0.85 for non-acclimatized users).

Acclimatization status has a considerable impact on the results of the standards. Currently, the choice is binary - acclimatized or not – and there is no intermediate path like percentage heat acclimatized. Also, there is no tool to assist in choosing how well subjects are acclimatized. We see three options here.

The first option is to consider all subjects using the tool as non-acclimatized. This is straightforward and makes the tool simple to use. The disadvantage is that people that are heat acclimatized get an early warning while they are still able to perform work without problems.

Second, an option is to supply a tool to help determine if a subject is heat acclimatized or not. Heat acclimatization is achieved when the body core temperature is higher than 38.5°C for at least one hour for at least 10 days (Taylor, 2014). The user generally does not know body core temperature, therefore a possible question to determine if a user is heat acclimatized or not

can be "have you been exercising in an environment of at least 25°C for at least an hour a day for the last 10 days?"

Another tool could be the automatic identification of the local climate - people living in hot climates can automatically be set to “acclimatized”.

Third, one may consider introducing a question to estimate the percentage of heat acclimatization. The criteria in the standards can then be interpolated. For example, the WBGT limit for heavy exercise is 25°C for acclimatized users and 20°C for non-acclimatized users. If people are 40% heat acclimatized, the criterion can be set to 22°C.

Heat acclimatization , heat acclimatization decay and heat re-acclimatization have different time periods for the cardiovascular system (heart rate), fluid balance (sweat rate) and temperature control (body core temperature) (Daanen et al., 2018). On average, one can state that heat acclimatization follows a logarithmic path; one can assume that the acclimatization status can be estimated by log (number of days exposed to heat) during the acclimatization period. During decay, the adaptations disappear more linearly by about 2.5% per day (Daanen et al., 2018). Heat reacclimatization occurs about 4 times faster than heat acclimatization (Daanen et al., 2018). Thus, an estimate of the percentage of heat acclimatization can be made , which seems more appropriate than setting the value at just yes or no. This third option may be used in a later and more specialized version of the tool, since it costs more time for the user.

References: Taylor NAS. Human heat adaptation. Comprehensive Physiology. 2014;4(1):325-65. Daanen HAM, Racinais S, Périard JD. Heat Acclimation Decay and Re-Induction: A Systematic Review and Meta-Analysis. Sports Medicine. 2018;48(2):409-30.

3. **During extreme weather events, people are at home. Hence, the influence of the indoor thermal environment will determine the comfort level. Is that taken into account by ClimApp or does it assume people are outdoors exposed to outdoor weather?**

Users can choose between indoor and outdoor mode.

4. Do you think that in the future ClimApp will be able to add real-time measured personal (physiological) data to the app to make it even more individualized? For example, special occupations need that kind of information (e.g. firefighters).

Yes, this is a good question. It is possible and it is a direction for further development and collaboration.

5. How does ClimApp deal with users who have medical issues? Have you worked with specific groups of people suffering the same respiratory or cardiovascular disease in order to define their specific vulnerability to weather changes?

The present version of ClimApp has not covered these issues. Further work is needed to determine the thermoregulation capacity that is affected by a specific medical issue.

6. Are you concerned that some of the tips might be taken too strictly? Users will err on the side of caution, and a result could be there will be less work productivity or outdoor play as result, since users will not want to bother with higher risk /difficult hydration strategies, etc. Kindergarten teachers would be overwhelmed with the additional data and not take kids outside.

This is a relevant concern, but advice would only be given if extreme heat (or cold) is forecasted. We try to give it attention and do more user testing. The recommendations are not mandatory. Users should also take local situations and health status into account and follow health authority's instructions.

7. The predictions are based on European population. Does ClimApp work for people living in hotter climates?

The human heat balance models are based on international standards, and user heat acclimatization status is taken into account, so ClimApp should be suitable for people living in climates hotter than in Europe. Although PHS is mainly based on studies conducted in Europe, applications of the standard to other countries can be carried out in collaboration with local partners. Please see the considerations of question 2.

8. Is it possible to make a risk prediction for a group of people? For instance, 10-30 persons? Will ClimApp be available for larger groups of people in order to make a risk prediction for multiple people in a single screen?

Yes, it is possible, for example for a group of workers in the same workplace, similar physical intensity and work clothing. One way to do this is to connect and project a mobile screen to a large screen at in the workplace, e.g. break room or lunchroom.

9. Clothes with active heating are becoming more common (socks, gloves and body heating). How does ClimApp take these kinds of clothing into consideration?

At present ClimApp has not included smart clothing, but this is definitely an interest area for further development and collaboration . If you are using clothing with active heating, then the thermal insulation is increased. How much the insulation is increased and what implications are for local and whole body need further determination and research.

10. Incorporating inputs related to the person instead of solely relying on weather data is key. Is there a strategy/plan to collect more data across the globe? This is an excellent tool to acquire the unique profiles and responses to a given heat stress for comparative analyses.

Good suggestion. ClimApp works globally. ClimApp incorporates inputs related to the individual. With the Research functionality we are able to collect feedback and data from individuals when users agree, and we use those data to further develop and validate ClimApp. We are interested in collaborating with local partners to further validate and develop ClimApp.

11. Did you involve the users during the development of the app?

Yes, and we continue to do so – our goal is to make a tool that not only has a strong scientific base, but also one that is used by real people in the real world to improve their lives. Here are some examples of us interacting with the users of ClimApp:

- A public health service organization and a climate service provider are partners of this project.
- Ten supporting stakeholders are involved.
- During prototype development, we obtained feedback from users through interview and an online questionnaire.
- We organize an annual theme day to interact with users from public and private sectors.

- A usability study was performed in a Usability Laboratory focusing on the navigation and interface design of the app.
- More than 60 users from different age groups and sectors were involved in testing ClimApp in the field during summer 2020.
- The ClimApp Virtual Conference took place on September 24, 2020.

12. What does your business model look like? Are you open to collaborating with clothing companies?

ClimApp is an ongoing publically-funded EU project and is freely available – there is no business model as such during project period. We are open to collaboration to further develop ClimApp to meet special needs of users, including collaboration with clothing companies.

13. Can ClimApp be used to detect heat stress in para athletes or those with diseases that may have impaired thermoregulation?

At present, ClimApp does not cover those conditions. In principle, it is possible to lower the heat stress warning threshold. But further research, development and validation are needed.

14. Can users get push warnings from the app?

No. We haven't yet figured out the best algorithms to do this. We would be very interested to hear from users who would like this feature added.

15. Have you analyzed the protective effects of these health guidelines or suggestions from ClimApp?

Not yet, this will be done in the future. We are open to collaborate to test and analyze the protective effects of ClimApp.

16. Does ClimApp have a forecast mode?

Yes, on ClimApp dashboard close to the color bar in the middle, there is a button called Forecast. When you click it, ClimApp provides you the forecast curve of ClimApp index (including heat and cold stress) for the next 24 hours.

17. Is the system open to receive external data such as Bluetooth data, for example from a temperature sensor on the body?

No. The present version of ClimApp works without external sensors and measurements. ClimApp does, however, receive user inputs such as activity level, clothing, heat acclimatization status, indoor temperature, etc.

18. Is ClimApp suitable for military use?

Yes, we also plan to further develop ClimApp that will allow for the selection of military clothing.

19. Can AI be used to further develop the App for detection of temperature of victims in a scenario of mass causalities in a cold environment?

It is possible to further develop this functionality. Using AI is an area for further development. We welcome collaboration.