

Name of research institute or organization:

Jugend-Forschungsgruppe academia, Kantonsschule Wattwil

Title of project:

Educational project for testing, evaluation and application of a self-developed method for recording and analysis of sleep at high altitude

Project leader and team:

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Project description:

Testing and evaluation of a self-developed recording device for the quantification of several physiological parameters during the sleep was the aim of the educational project planned and performed by the youth research group academia. The members of the youth research group are current and former students of the Wattwil State College for Higher Education (Kantonsschule Wattwil), who are interested in natural sciences and perform various research projects in their spare time under the supervision of four college teachers.

For the present project, sleep recordings were performed with volunteers of the youth research group at low (410m) and high altitude (3450m). Several non-invasive techniques such as electrophysiology, breathing sensors, accelerometry, pulse oximetry and skin conductivity were used. The recording device and analysis software had been extended and improved gradually in the past few years. The implementation of electroencephalography (EEG) was one of the last substantial progresses. We could apply this method in the current study for the first time, which enables the manual scoring of sleep stages and spectral analyses of the sleep EEG. Furthermore, our self-developed method was compared to a commercially available recording system for sleep-related respiratory disorders.

Analyses are currently in progress. The results will show the accuracy of our method in detecting altitude related changes in the investigated sleep parameters. Particularly, such changes are supposed to include an increase in the apnea/hypopnea index (AHI) in the breathing data and changes in the EEG spectral analyses at high altitude.

A first look at the data confirms the good signal quality in most of the recordings. For example, Fig. 1 shows a section of the EEG recordings with delta waves (0.8-4.6 Hz), which are associated with deep sleep (stage N3). Fig. 2 illustrates a sequence of periodic breathing, a characteristic respiratory pattern with alterations in the breathing amplitude observed in several volunteers at high altitude. Further analyses and statistics are needed to quantify and score the sleep recordings in detail.

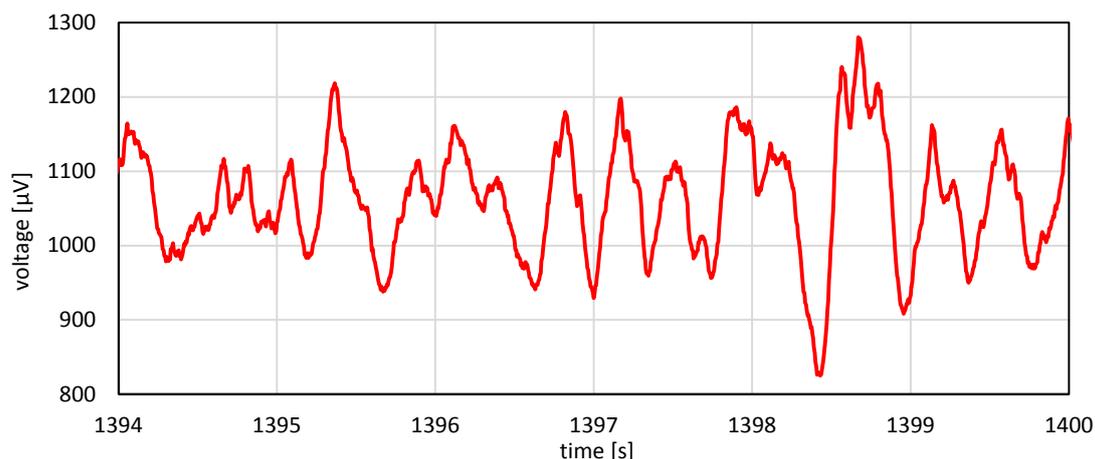


Figure 1. Example of an unfiltered EEG recording showing delta waves (0.8-4.6 Hz), typically seen in deep sleep (stage N3). The signal has an offset of around 1000 μV .

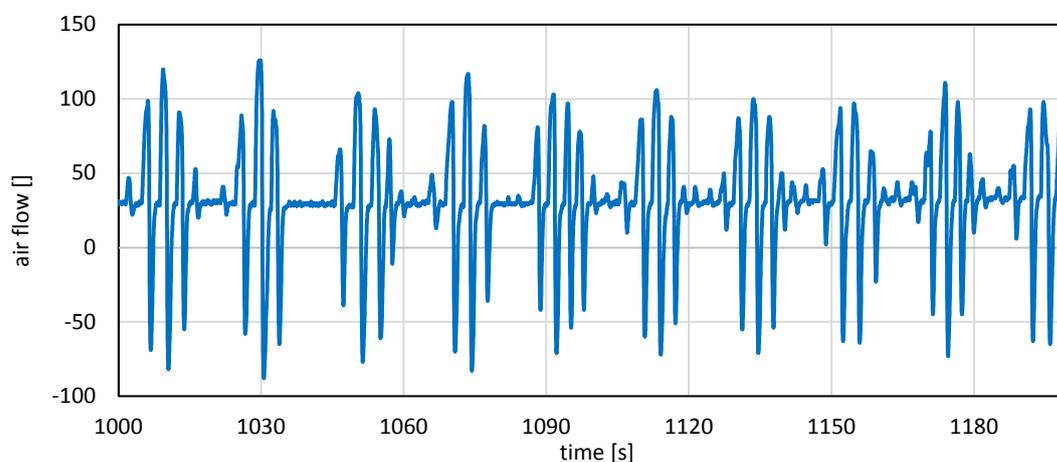


Figure 2. Example of a breathing signal showing periodic breathing, a characteristic respiratory pattern at high altitude.

Key words:

Youth research group, sleep recording, high altitude, hypoxia

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