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Deliverable 49

Report on collated long-term hydrological and meteorological data from glacierised and non-glacierised alpine river basins

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| Dissemination Level (tick appropriate box) | | |
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1. INTRODUCTION

In this report a descriptive overview is provided of the long-term hydrological and meteorological data collated from alpine river basins.

Task 2.3 of WP1 deals with long-term changes of climatic parameters and their impact on the discharge of alpine rivers. We focus on pristine river basins in the Central Eastern Alps (Tyrol, Austria) to intensively study the river flow regime responses to long-term changes of precipitation and air temperature, as well as to changes in precipitation patterns and seasonal shifts, and the occurrence of extreme events like floods and droughts.

The long-term increase of air temperature has led to a pronounced retreat of glaciers in high altitude and latitude areas, resulting in changed discharge patterns, like shifts in the diurnal and annual course of runoff and an overall increase of total annual discharge. We will particularly address the impact of glacier retreat on river flow regimes, selecting catchments with varying degrees of glaciation.

2. SELECTED SITES

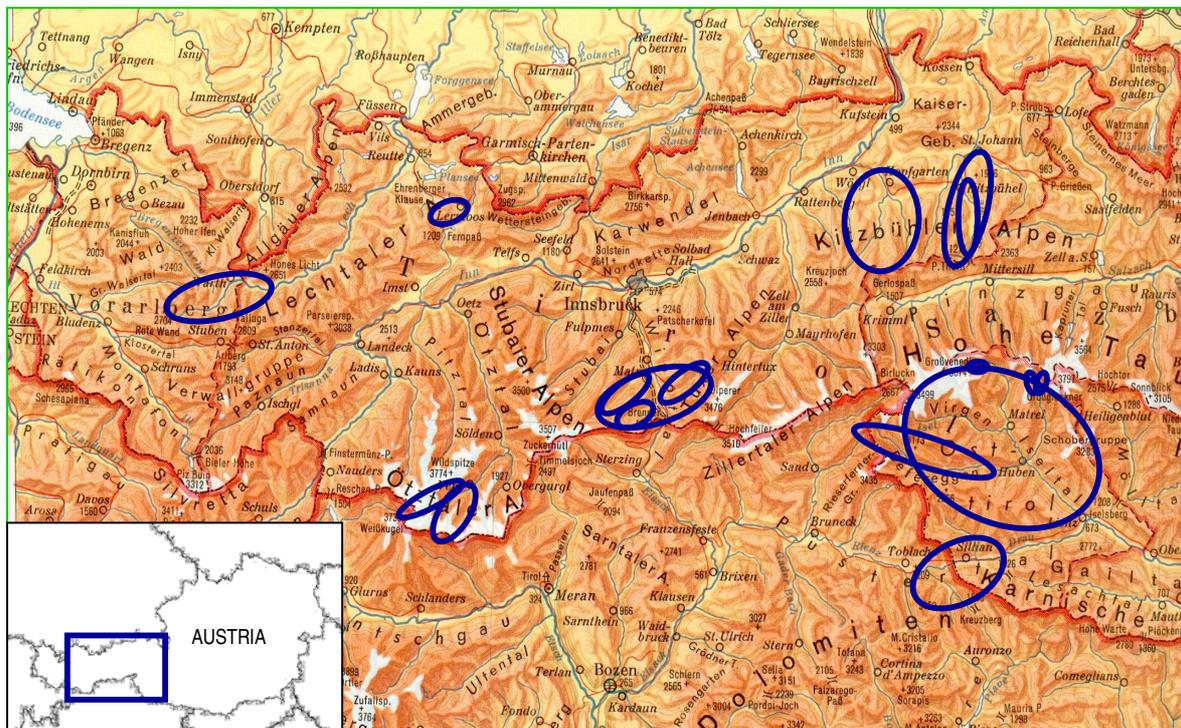
We have selected 17 river basins (Table 1). The basins should be pristine, with as little anthropogenic impact as possible on the water cycle, e.g. no reservoirs, no water abstraction out of the watershed. The catchment areas vary between 14 and 1200 km², and cover an elevation range from about 500 to 3700 m a.s.l.

Special attention was paid to the catchment characteristics, i.e. the selected basins should vary in their degree of glaciation, in catchment size, distance to the main divide of the Alps, major bedrock and relief. In particular, we have selected basins north and south of the main ridge of the Alps, which are generally exposed to different synoptic weather situations they receive precipitation from. Therefore, the occurrence and frequency of extreme events will be different for northern and southern basins. Flood events, for instance, were recorded in 1965, 1985, 1991, 1999 and 2002 for the northern basins and in 1965, 1966, 1985 and 1987 for the southern basins.

Table 1. Selected river basins and gauges, height of the gauge and size of the watershed areas.

| River basin | Gauge | Height of gauge (m) | Watershed area (km ²) |
|---------------------|-----------------------|---------------------|-----------------------------------|
| Lech | Steeg | 1109 | 248 |
| Loisach | Ehrwald | 958 | 88 |
| Venter Ache | Vent | 1890 | 165 |
| Rofenache | Vent | 1890 | 98 |
| Obernberger Seebach | Gries/Brenner | 1175 | 58 |
| Schmirnbach | St. Jodok | 1121 | 109 |
| Gschnitzbach | Steinach | 1040 | 111 |
| Sill | Piug | 1005 | 342 |
| Brixentaler Ache | Bruckhäusl | 524 | 322 |
| Kitzbüheler Ache | Kitzbühel | 735 | 153 |
| | St. Johann/Tirol | 660 | 332 |
| Gschlößbach | Innerschlöß | 1668 | 40 |
| Dorferbach | Spöttling | 1486 | 47 |
| Teischnitzbach | Spöttling | 1486 | 14 |
| Schwarzach | Hopfgarten/Defereggan | 1096 | 269 |
| Isel | Lienz | 667 | 1199 |
| Drau | Rabland | 1071 | 374 |

Fig. 1. Location of selected river basins (indicated by blue ellipses).



Seven out of the 17 selected basins are glacierised. The degree of glaciation varies from a few per cent up to about 40% of the watershed area.

Among the glacierised basins, the Rofenache catchment has an outstanding position. Its glaciers, which cover 40% of the total area, have been intensively investigated since about 50 years. At Hintereisferner, in particular, mass balance and meteorological studies have been performed since 1952, thus building one of the world's longest homogenous glacier mass balance series. Therefore, the Rofenache basin represents a key site to evaluate the impact of glacier retreat on river flow regimes.

3. DATA

Discharge

For all basins daily values of discharge ($\text{m}^3 \text{s}^{-1}$) are available since 1951. Only for Rofenache, data series starts in 1965. Additional information on extremes (monthly minimum and maximum discharge) is available as well.

Precipitation and air temperature

For all 17 river basins meteorological and hydrological stations with daily measurements of precipitation (mm) and air temperature ($^{\circ}\text{C}$) have been selected. Data series of daily precipitation and air temperature have been collated for 25 sites and cover an elevation range between 600 and 1600 m a.s.l. Most data series start in the 1970's, while a few go back to 1900.

For a few watersheds monthly records of precipitation are available from measurements with totalizing precipitation gauges. These gauges are generally exposed at altitudes above 2000 m up to 3000 m. They provide precipitation data from areas, which are difficult to access and where daily measurements are not feasible.

Most totalizing precipitation gauges are exposed in the watershed of Rofenache. There, data from up to 6 gauges go back to the 1950's.

Access to discharge, temperature and precipitation data has been arranged by the respective owners of the data with U. Nickus. It is not permitted by contract to grant data access to third parties.