







Using a combination of existing and newly procured geologic data, we have constructed a geologic map of the northern-half portion of the 7.5 minute Chamblee quadrangle in metropolitan Atlanta at a 1:24,000 scale. The mapped area is 31.3 square miles and lies in the complex Inner Piedmont region of southern Appalachia. Our aim was to remedy geologic uncertainties of regional delineations, fault zones, and structural locations based on geologic maps published in 1976 (1:500,000 scale) and 2003 (1:100,000 scale) across the tri-county area of Dekalb, Fulton, and Gwinnett counties. Unmanned aerial vehicle (UAV) drone surveying, digital terrain modeling, GIS file digitization, photogrammetry, and petrographic analyses were employed to support field mapping efforts.

The rocks mapped within this region are peri-Laurentian Tugaloo terrane igneous and metasedimentary units. They were emplaced by transform faulting around 400 to 360 Ma during the Neo-Acadian orogeny.

- The **Sandy Springs group** is dominant in the study area and is located NW of a large shear zone (Brevard Fault). It is chiefly composed of a metamorphosed succession of sedimentary rocks. These include:
- Cambrian Chattahoochee Palisades Quartzite (€cp), which is a massive and vitreous white-blueish feldspathic quartzite,
- Cambrian **aluminous schis**t (€as) found with abundant kyanite, garnet, and staurolite minerals, and the
- Cambrian **aluminous quartzite** (£aq) which is a thinly bedded unit of muscovite-bearing quartzite. Field mapping revealed four additional major units.
- The Middle Ordovician to Late Proterozoic **Powers Ferry** Member (OZsp) consists of a biotite gneiss schist with interbedded amphibolite.
- The Permian to Upper Ordovician Crider gneiss (OZcr) is a feldspathic, muscovite, quartz gneiss and is identifiable by its abundance of muscovite grains.
- The Middle Ordovician to Late Proterozoic garnet-rich schist (OZmgs) is a mica schist bearing medium- to large garnets and has been observed in contact and underlying the Crider gneiss (OZcr) unit.
- And lastly, the Permian to Upper Ordovician phyllonitic **Button** schist unit (POb) that exhibits distinctive fish-scale texture and S-C fabric mylonization.

The resolution of our map will allow for targeted investigations into the emplacement of the Tugaloo terrane and the processes that shaped the eastern North American margin between the Cambrian to Permian. Our contribution includes a geologic map in a digital format that allows geospatial connection to local geologic structures and materials in real-time through GIS-ready portable devices. We hope that this project will benefit infrastructural projects in one of the fastest-growing metropolitan regions in the country.

# MOTIVATION

Two current map publications exist for this study area. (1) The Geologic Investigations Series Map I-2602 (Higgins and others, 2003) covers the Atlanta 30' x 60' quadrangle at 1:100,000 scale. It was selected as the reference base map for our study as it was the most detailed and updated geologic map published at the time of our bibliographical review. It is available only as a scanned digital raster image which restricted data management, extraction, and further analysis. (2) The Geologic Map of Georgia (Lawton and others, 1976) includes the Atlanta region at a scale of 1:500,000. Digitized feature layers are available, but the spatial resolution was much too coarse to accurately represent mappable units and capture the structural intricacy of our study area. In comparing the two published maps, we noted some spatial discrepancies amongst the locations of faults, boundaries between different rock types, and their associated structures that could be resolved by mapping at a finer-resolution scale to adequately illustrate the geologic variability. Detailed information regarding the nature and origin of Atlanta's localized geology is in demand and essential for informed policy decision-making, public health safety and intervention, and economic growth. We intend to bridge a data gap by making this information publicly accessible by private entities, scientific communities, decision-makers, and the general public.

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## **AFFILIATIONS**

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## **RELATED LITERATURE**

- Higgins, M. W., Crawford, T., Atkins, R. L., & Crawford, R. (2003). Geologic Map of the Atlanta 30' x 60' Quadrangle, Georgia. Geologic Investigations Series Map I-2602. 10.3133/i2602
- Higgins, M. W., & McConnell, K. I. (1978). The Sandy Springs Group and Related Rocks in the Georgia Piedmont Nomenclature and Stratigraphy. Short Contributions to the Geology of Georgia Bulletin 93, 50-55.

# **GEOLOGIC MAP OF THE TUGALOO TERRANE IN THE** VICINITY OF THE BREVARD SHEAR ZONE, NORTHERN-HALF OF THE CHAMBLEE QUADRANGLE, GEORGIA



\*\*Chattahoochee Palisades Quartzite (Cambrian?)—White to yellowish, sugary to vitreous, pathic quartzite and garnetiferous quartz-muscovite schist. Commonly adjacent to and gradationa the aluminous schist unit (€cp). Holds up low ridges that stand 30 to 60 m above intervening valleys weathers to a quartz-sand saprolite/soil that is locally mineable for quartz sand where the unit is atigraphically and (or) tectonically thickened. Within the Brevard fault zone, the quartzite is generally assive, vitreous, white to bluish, and generally continuous for many kilometers (Higgins and McConne

Crider gneiss (Middle Ordovician? to La

ughout this Crider Gneiss (**OZcr**) sample as ale. tabular bodies. (**B**) Common in this un

> breakdown or reaction primary pha

plectic textures (Spt) are recognized b

978; Higgins et al., 2003).

Geologic map modified from the Scientific Investigations Series Map I-2602 (Higgins et al., 2003) Projected Coordinate System: NAD 1927 UTM Zone 16N

OZm

## DIGITAL MAPPING









Digital elevation models (DEM), digital terrain models (DTM), and drone images were used to visualize and interpret the north-half Chamblee region's bare ground topography and elevation. These models were created using ground-only points in LIDAR point cloud data.

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# STRUCTURAL FINDINGS

SECTION SHOWING THE GENERAL RELATIONSHIP OF THE ROCKS ALONG A - A' ENGRAVED ON THE MAP







N = 30 Planes data set (petals parallel strike direction): Max value = 50% between 046° and 060° Mean Vec = 052.1° ± 07.8°; Average Length = 0.7546 Circular Variance = 0.2454; kappa = 2.3693

[Krumbein's axial mean; uncertainty is 1 standard error,

for 95% confidence level multiply by 1.96]

Zone of the north-half 7.5-min Chamblee Quadrangle.

dominance of NE-striking orientations with planes dipping to the SE, indicating that these structures recent deformation episodes.

——— Brevard Fault Zon	e					
€as		DZm	OZsp		PYI	A' POb
Ball Mill Fault				Long Island Fault		

